Staff Paper

Farmer perspective on the use of and demand for seeds of improved bean varieties: Results of beneficiary surveys in Guatemala, Honduras and Nicaragua

by

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Executive Summary

The Bean Technology Dissemination (BTD) project was initiated in 2010 in four countries in Central America and the Caribbean based on the principle that good seed is the foundation of good agriculture. It was designed to introduce technologies (i.e., improved varieties) that increase bean productivity to a large number of rural families, and to lay the foundation for a sustainable bean seed system as measured by the ability to supply and meet the country's need for affordable quality seeds of improved varieties. This research report presents the results of the surveys of BTD project beneficiaries conducted in Guatemala, Honduras and Nicaragua. The purpose of this report is to provide a descriptive analysis of beneficiary profiles and the household bean production economy in the target areas, and to assess the pros and cons of the availability of seeds of improved varieties distributed by the BTD project as perceived and realized by the project beneficiaries.

A two-stage randomized cluster sampling method was used to select 500 project beneficiaries each from the three countries for this survey. For Nicaragua, the sample was representative of project beneficiaries from all the regions for year 1 (2010-11), and for Guatemala and Honduras, the sample was representative of a sub-set of Departments (i.e., mainly the Feed the Future [FTF] zone of influence) for year 2 (2011-12). The survey was conducted by interviewing the household member that had received the bean seed from the BTD project. The number of households (HH) actually surveyed was 500 in Guatemala, 441 in Honduras and 480 in Nicaragua.

Results indicate that the profile of an average beneficiary HH in the study area varies across the three countries. On average, the HH size is larger and land holdings smaller in Guatemala than in Honduras and Nicaragua. A typical beneficiary HH in Guatemala owns less number of tropical livestock units and other assets, lives in a dwelling that has less amenities and facilities, and lives in a more densely populated area than a typical beneficiary in Honduras and Nicaragua. In general, the socio-economic profile of beneficiary HHs in Guatemala appear to be more concentrated on the disadvantaged and more challenging spectrum of the distribution relative to the average HH beneficiary in Honduras, which in turn is more disadvantaged than an average HH beneficiary in Nicaragua. It is important to point out that this difference in the profile of beneficiary households is accentuated by the fact that in Guatemala the focus of the survey was only on the FTF Departments.

Despite the differences in the socio-economic and demographic profiles of beneficiary HHs, they share a similar agricultural profile when it comes to the importance of beans in the farming systems. Across all three countries, beans are reported as one of the two most important crops in terms of total area planted, purchased inputs devoted and family labor invested. The average total area planted to beans per HH was 0.11 manzanas in Guatemala, 0.44 manzanas in Honduras and 1.37 manzanas in Nicaragua. The significant difference in the total bean area planted per HH is reflective of the relative size of total land holdings across the three countries. As a result of larger bean area, beneficiaries in Nicaragua and Honduras report producing, selling and consuming more beans, and are thus more 'bean secured' than the beneficiaries surveyed in Guatemala.

The quantity of project seed received and planted by the beneficiaries surveyed varies significantly across the country and reflects the different socio-economic and farming

characteristics of target population in each country. The average quantity of project seed a typical HH planted was 5 lbs in Guatemala, 27 lbs in Honduras and 50 lbs in Nicaragua. A typical beneficiary farmer in Guatemala, Honduras and Nicaragua, respectively harvested on average 55 lbs, 458 lbs and 491 lbs of bean grain from the parcel on which the project seed was planted. This translates into 756, 1299 and 796 lbs/manzana bean grain yield in Guatemala, Honduras and Nicaragua, respectively. Although these are not impressive bean yields, 'good yield' was overwhelmingly cited as one of the top two characteristics farmers liked about the variety they had received from the project. A high percentage of beneficiaries expressed their interest in planting the variety of seed they had received from the BTD project in the next season. Among those that expressed such interest, 80-90% plan to either increase the area planted to a given variety in future or maintain the same area as planted in the season when project seed was planted. This expression of interest to continue to grow the variety at the same or augmented level renders support to the BTD project strategy of distributing small quantities of seed which can then be multiplied, saved and expanded to more area on one's own farm by the farmer him/herself. The interest to continue to grow the varieties also indicates that farmers were satisfied with the quality and performance of varieties received through the project. In fact, a high percentage of farmers rated the seed quality higher than or similar to other seed planted in that season.

Since bean 'seed' is highly competitive with bean 'grain,' there has to be product differentiation in terms of how bean seeds are marketed or delivered to farmers and whether farmers are able to perceive that product as a quality planting material. Sealed package with a label that describes the product is the gold standard of how seeds should be delivered to farmers if the aim is to differentiate the product and create a demand for seed. The survey results indicate that not all the beneficiaries received the bean seeds in a sealed package with a label. Honduras comes the closest in terms of meeting this standard as 83% of farmers reported receiving the project seed in a sealed package with a label and other 8 % received it in a bag that was either sealed but did not have a label (3%) or was not sealed but had the label (5%). But in Nicaragua, only 30% of farmers received the seed in a package that was sealed and had a descriptive label with all the product information.

Other characteristics of a seed system that end users value and that may influence their demand for seed are the accessibility of seed and the timeliness of its availability. Beneficiary perspective on these two aspects ranges widely across the countries. Almost 80% of farmers in Honduras, 62% in Nicaragua and 56% in Guatemala reported that the project seed was delivered to them in the community where they reside. Those that did not receive the seed in the community had to travel on average about 6-14 km to get the seed.

Ability to deliver the seed in advance of the planting date is an indicator of the reliability of the seed system to meet the needs of the community in a timely manner, and thus an important determinant of future demand. A large number of beneficiaries (50-70%) received the project seed way in advance of the planting season (at least one week before), which is a good indicator of reliability of the seed system promoted by the BTD project partners. However, a significant percentage of farmers in all three countries reported receiving the seed less than one week before or after the planting date. The issue of 'late' delivery of seed was cited by close to 50% of farmers in Guatemala, 20% of farmers in Nicaragua and 19% of farmers in Honduras as a

disadvantage of the bean seed delivery system used by the BTD project. Inadequate capacity to meet the quantity and diversity of seed needs of the community, were identified as the other disadvantages of the different seed delivery systems promoted by the BTD project. On the flip side, proximity of the seed source to the community or its presence in the community and flexibility in payment method were cited as the two main advantages.

The sustainability of the seed system also depends on whether it can recover the cost of producing and delivering quality seed demanded by the farmers. In the case of the BTD project, this principle was not a driving force in the design of the project to reach the target number of beneficiaries. This is evident from the fact that more than 70% of farmers in Guatemala and close to 50% farmers in Honduras reported receiving the project seed free of cost. As against this only 5% farmers in Nicaragua received seed free of cost. For those that had a payment agreement, the most common agreement was to return the same amount or double the amount of grain after harvest. In Nicaragua, this was the dominant method of payment reported by the farmers. For those that paid in kind for seed received from the project in the form of grain, a majority of farmers indicated that the price they paid was at par with his/her willingness to pay or lower than what s/he was willing to pay. This is encouraging and in general, lends support to the effectiveness of the in-kind payment agreements targeted to different groups of farmers.

A majority of farmers indicated that the quantity of seed they received from the project was adequate to meet their needs. But a significant percentage of farmers in all three countries, especially in Nicaragua (44%) expressed the need for more seed. Among those that indicated wanting more seed, the additional quantity needed was 9 lbs in Guatemala, 45 lbs in Honduras and 68 lbs in Nicaragua, and farmers were willing to pay on average US$ 0.93, $ 0.64 and $ 0.41 per pound of additional seed. This represents an average willingness to pay 36%, 85% and 27% price premium above the average grain price received by farmers respectively in Guatemala, Honduras and Nicaragua. However, this reported willingness to pay is by farmers that expressed the need for more seed, which may imply that they have larger land holdings and thus better endowed than the farmers who did not express the need for more seed. Thus the average price premium reflected in the willingness to pay for seed may be an upper bound rather than a mean or a median value for the entire beneficiary population surveyed.

The experience of the BTD project offers an opportunity to derive lessons for extension of such efforts in other countries. First, the high level of satisfaction expressed by beneficiary farmers suggests that it is possible to design a seed system to reach a large number of farmers across the country and deliver quality seed on time and in close proximity to communities where farmers reside. However, the results of the beneficiary survey point to the logistical challenges of designing a seed system that meets all the criteria of efficiency and sustainability. Future efforts must devote more attention on when and where the seed is delivered, and how it is delivered to the farmers. Since bean ‘seed’ competes with bean ‘grain’ as planting material in smallholder farm economy, it is important that the seed dissemination efforts devote adequate attention on the time, place, and the packaging and labeling aspects to differentiate the product they are distributing and to create a demand for seed.

Second, the results of this study indicate that in some communities meeting the seed needs based on 100% cost-recovery principle may not be possible. Thus, any scaling up efforts that target small holder farmers should be based on a two-pronged approach of subsidies and cost recovery.

Third, if the principle of cost-recovery is imposed, there is potentially a greater probability of recovering the total or partial cost of seed production in models where farmers get the final seeds from a 'local' entity such as a CIAL or a community seed bank. From the perspective of the beneficiaries, flexibility in payment method and proximity/presence of seed production / distribution closer to the community were identified as the strength of the models used by the BTD project. Future seed system development efforts should integrate these features (i.e., flexibility in payment method and proximity of seed production closer to the community) to increase the likelihood of recovering at least part of the cost of disseminating quality seeds.

Lastly, to realize the full potential of the quality seeds in farmers' fields requires access to other complementary inputs and information/knowledge on agronomic and farm practices. Thus any extension of BTD type project in future should be based on integrating seed distribution efforts with technical support (or vice versa).

Farmer perspective on the use of and demand for seeds of improved bean varieties: Results of beneficiary surveys in Guatemala, Honduras and Nicaragua

1. Introduction

Common bean *(Phaseolus vulgaris)* is widely produced and consumed throughout Latin America and is strategically important for food and nutritional security of both the rural and urban poor. Long-term investment in research by USAID funded Feed the Future Legume Innovation Lab (and its predecessor Bean/Cowpea Collaborative Research Support Program (CRSP)--1980-2007, and the Dry Grain Pulses CRSP--2007-2012) has resulted in the development and release of many disease resistant bean varieties with a potential to increase bean grain yield in Central America and the Caribbean (Reyes *et al.* 2013). Unfortunately, many resource-poor farmers do not have access to these improved bean varieties developed through research due to the lack of a private sector led seed multiplication and dissemination system, and inadequate efforts to address this gap by the public sector. Consequently, bean yields remain low, contributing to food insecurity and limiting the potential of beans to be a profitable cash crop.

To address the critical shortage of high quality bean seed that smallholder resource poor farmers need to increase productivity, in 2010, the Dry Grain Pulses CRSP, through funding from USAID, initiated the Bean Technology Dissemination (BTD) project focused on four countries in Central America and the Caribbean—Guatemala, Honduras, Nicaragua and Haiti, which are among the poorest countries in the Western Hemisphere. The objective of the BTD project was to enable a large number of rural families to escape poverty by introducing technologies that improved the productivity and economic viability of small-scale farms, improve the nutritional status of rural and urban poor through increased availability of beans in the market place, and lay the foundation for a sustainable bean seed system. A major focus of the BTD project has been towards building "seed security" in the region through the multiplication, distribution and effective storage of bean seed of improved varieties.

The BTD project implemented in four countries in Central America offered a good opportunity to do an in-depth analysis of: 1) the unique features of different models for seed multiplication and distribution so as to identify principles of sustainability present/absent from these different models and derive implications and lessons for broader applicability to other countries; and 2) to assess the benefits derived from these dissemination efforts from the perspective of the farmers receiving these seeds. Thus, a monitoring and evaluation (M&E) component was integrated in the design of the overall BTD project to conduct research studies focused on these two analytical questions. This report represents one of the outputs of this M&E Activity focused on the second research question. It presents the summary results of the beneficiary surveys conducted in three countries—Guatemala, Honduras and Nicaragua with the aim of evaluating the effectiveness of bean seed dissemination models from the beneficiary perspective, and assess the benefits derived by the farmers who received the improved bean seeds distributed by the BTD project. Results of the research study focused on the first analytical question are presented in a separate report (see Reyes, DeYoung and Maredia 2014).

Specific objectives of this research report are:

1. To present a descriptive analysis of BTD project beneficiary profiles and the household bean production economy
2. To assess the pros and cons of the availability of seeds of improved varieties distributed by the BTD project as perceived and realized by the project beneficiaries
3. To derive evidence-based lessons on the strategy of scaling up bean seed dissemination efforts to increase agriculture productivity, profitability and income for the rural poor

In Section 2, we first give a brief overview of the BTD project setting and its achievements. This is followed by the description of this study, the sampling method used and the scope of the survey conducted in three countries—Guatemala, Honduras and Nicaragua. Results of data analyses are presented in Section 4 followed by the discussion of lessons learned and concluding remarks.

2. Bean Technology Dissemination project: Setting, description and major achievements

Guatemala, Honduras, Nicaragua and Haiti, the focal countries of the BTD project, have high incidences of poverty (> 50%), ongoing chronic food insecurity, and wide spread malnutrition. Households engaged in agriculture and located in the rural regions of these countries are the most vulnerable to poverty. Climate change (e.g., more frequent drought events, high temperatures) and natural disasters (e.g., flooding due to hurricanes, earthquake in Haiti) are major factors contributing to the low productivity of the principal staple crops in the region (maize and beans). Farmer access to improved technologies to increase productivity of basic grains (including dry grain pulses/beans) and increased resilience to crisis events were thus identified as important strategies under the 2010 USAID's Feed the Future (FTF) implementation plans in Guatemala and Nicaragua, the two FTF priority countries at the time.

The rapid bean technology dissemination project initiated by the Dry Grain Pulses CRSP in 2010 was an effective and appropriate response to the goals of the Feed the Future program being implemented by the USAID Missions in the region. Increasing the productivity of beans by small holder farmers was expected to address both the food and nutritional security concerns of these governments, as well as potentially reduce malnutrition and contribute to long-term sustainability and vitality of agriculture systems.

The BTD project was built on the long history of engagement in the region by the Dry Grain Pulses Collaborative Research Support Program (CRSP) (2007-2012) and its predecessor, the Bean/Cowpea CRSP (1980-2007). Through the CRSP, strong ties had been established with National Agriculture Research and Extension Systems, universities, NGOs, farmer associations (including local agricultural research committees--CIALs), and private sector organizations that provide support services to the bean sector. These relationships and an understanding of the bean sector in Honduras, Guatemala, Nicaragua and Haiti were essential elements that contributed to the design and implementation of the BTD project activities in the region.

The objectives of the technology dissemination project implemented from 2010-2013 were to increase agriculture productivity, profitability and income of rural smallholder farmers by introducing proven technologies. One of those technologies that were a major focus of the BTD

project was improved varieties of beans, which is the focus of this report. The project provided farmers with small quantities (10-20 lbs) of affordable quality seed with the expectation that these will be multiplied, stored and shared with others within the community. Access to good quality seed at the farm and community level would then directly translate in to household food security.

The BTD project has used different models of seed multiplication and distribution across the four countries to fill in the gap between technology supply and demand. For example, in Nicaragua the seed multiplication and distribution model is based on the concept of community managed and operated seed banks or "*bancos comunitarios de semilla*" (or community seed banks). The seed bank model operates on the principles of self-help, whereby community members come together to produce seeds to meet their own current needs, save seeds for future seed security, and sell excess seeds to generate revenues to cover production costs. The national bean research program of Nicaragua (INTA) through its network of regional offices played an important role in supplying the basic seed stocks of improved varieties to community seed banks and provided technical assistance to ensure that the seeds produced by the seed bank meet some minimum quality standards as planting materials. In Honduras, the model used was based partly on a private university (Zamorano), CIALs (or farmer associations), seed producers (i.e., farmers, micro-enterprises, and local seed banks), government, and NGOs taking up the role of seed multiplication and distribution. In Guatemala, the model was based on the public and NGO sector playing a major role throughout the seed value chain. Finally, in Haiti, the project tried to use a dual approach based on private sector selling the seeds through retail outlets and the public sector distributing the seeds to resource poor farmers.

Table 1 provides a summary of achievements of the BTD project in terms of numbers of farmers reached, quantity of seeds produced and disseminated, and number of varieties included in these efforts across the project countries. Through partnerships with the national agricultural research systems and the regional bean breeding program, the project was able to use the network of NGOs, farmer associations and community seed banks to disseminate high quality (quality declared/apta or certified) seeds of improved bean varieties to more than 100 thousand farmers in major bean growing regions of all four countries. The varieties distributed through this effort included disease-resistant black ('DPC-40', 'ICTAZAM', XRAV40-4, 'Aifi Wuriti'), small red ('Amadeus 77', 'CENTA Pipil', 'Carrizalito', 'DEORHO', Cedrón, Victoria, 'INTA Rojo'), red mottled (PR9745-232) and white (Verano) bean cultivars developed through CRSP-NARS collaborative research efforts. All of these varieties have commercially acceptable seed types and resistance to Bean Golden Yellow Mosaic Virus and Bean Common Mosaic Virus. These diseases can cause yield losses of > 50% under severe disease pressure. DPC-40-4 and XRAV-40-4 also have resistance to Bean Common Mosaic Necrosis Virus which is a serious disease in Haiti and a threat to bean production in Central America. The CIALs, in collaboration with NARS, developed Cedrón and Victoria thru participatory plant breeding in Honduras.

A mass multiplication of seeds of these improved varieties was undertaken by project partners over the three years of the project which led to the production and distribution of 543 metric tons of seeds across all four countries (Table 1). More than hundred thousand smallholder bean farmers were reached by the BTD project, each receiving an average of 5.3 kg (or 11.7 lbs) of good quality seeds to multiply and use on their own farms or share with others in the community. Overall, the efforts of the BTD project over the last 3 years have contributed to the goal of 'seed

security', which is considered to be a necessary step towards addressing food insecurity as well as to increasing productivity of bean farmers.

The indicators reported in Table 1 provide an aggregate picture of project performance and achievement as reported by the project partners that provided these services. For the sake of transparency, and with the spirit of learning from this experience, it is also important to evaluate the performance and achievements of the project from the perspective of the targeted beneficiaries, i.e., bean farmers that received the seeds. This is exactly the motivation of the study described in this Report. It was undertaken by researchers from Michigan State University's (MSU) Agricultural, food and Resource Economics Department that were external to the project implementation team. The goal is to provide an objective assessment of the pros and cons of the BTD project as perceived by the beneficiaries and to collect information to better understand the socio-economic characteristics of bean farmers, the importance of beans in their farming operations, their demand for bean seeds, and constraints they face. A complementary objective of this study is to provide feedback to project partners and stakeholders and contribute towards improving any scaling up efforts planned in the future. We describe the study design and present the results of the survey data analysis in the following sections.

Table 1. Cumulative results of the BTD project's bean seed dissemination efforts in Guatemala, Honduras, Nicaragua, and Haiti, 2010-2014

Achievement	Year 1 (2010-11)	Year 2 (2011-12)	Year 3 (2012-14)	Cumulative (2010-14)
Number of small-holders reached with quality seed of improved bean varieties				
Guatemala	4,998	7,364	20,980	33,342
Honduras	4,334	5,980	15,686	26,000
Nicaragua	5,365	4,966	5,714	16,065
Haiti	0	9,077	17,563	26,640
Quantity of seeds of improved bean varieties disseminated to farmers (MT)				
Guatemala	45	37	95	177
Honduras	42	53	42	137
Nicaragua	63	59	46	168
Haiti	0	21	40	61
Number of improved bean varieties disseminated				
Guatemala	2	3	4	4
Honduras	18	17	24	28
Nicaragua	1	3	6	n.a.
Haiti	1	2	2	n.a.

Source: BTD Project Final Report Table 1. n.a. = not available

3. Method and Data

3.1. Sampling and data collection method

To achieve the objectives of this study, beneficiary surveys were conducted in three BTD focal countries in 2012 (Nicaragua) and 2013 (Guatemala and Honduras).[2] A two-stage randomized cluster sampling method was used to select 500 project beneficiaries each from the three countries. The sampling frames for this survey were the lists of beneficiaries of the BTD project for 2010-11 (for Nicaragua) and for 2011-12 (for Guatemala and Honduras) as submitted by the project country coordinators. Thus they represent project beneficiaries from cohort 1 in Nicaragua and from cohort 2 in Honduras and Guatemala. The list included the names of the beneficiaries and their locations in terms of the name of the community, municipality, department and region (in the case of Nicaragua) they belong. It included 5200 beneficiaries across 5 regions and 15 Departments in Nicaragua, 5900 beneficiaries across 13 Departments in Guatemala, and 4677 beneficiaries across 15 Departments in Honduras.

In Nicaragua, the geographic coverage of the survey was all five regions of the country that were targeted in 2010-11–i.e., Centro Norte, Centro Sur, Las Segovias, Pacífico Norte and Pacífico Sur. However, due to resource constraint, beneficiary surveys in Guatemala and Honduras focused on a sub-set of Departments. In the case of Guatemala only the five USAID Feed the Future (FTF) priority Departments were included in this study. These were: Huehuetenango, Quetzaltenango, Quiché, San Marcos, and Totonicapán. In Honduras, the survey focused on seven Departments, five FTF priority Departments (Copán, Intibucá, Lempira, Ocotepeque and Santa Bárbara) and two non-FTF Departments (Atlántida and Yoro). These were selected based on the geographic proximity criterion and the goal of including enough communities that were targeted by both Zamorano and DICTA, which used different models of seed dissemination in the country (Reyes, DeYoung and Maredia 2014).

The goal was to survey five beneficiaries each from 100 communities (i.e., clusters) across the target regions/departments. This was done using the following three-step process:

a. In step 1, all the communities in the selected regions/Departments that had less than five beneficiaries were eliminated from the list.
b. In step 2, (X_i *100) communities (from the list of communities that had at least five beneficiaries) were randomly selected from each region/Department, where X (rounded to the nearest integer) represents the share of beneficiaries targeted by the BTD project in region/Department 'i' as a proportion of total beneficiaries across all the selected regions/Departments (such that sum of X_i across all i is 1).
c. In step 3, five farmers were randomly selected from each of the 100 communities selected at the end of step 2.

A replacement list of randomly selected farmers from within the selected communities, and from other communities within the municipality (in case all five farmers in a community were already selected in step 3) was also prepared as a backup in case any selected farmer from step 3 was not

[2] Due to several reasons, the Project had experienced a slow start in Haiti. After consultation with the project management team, it was decided to focus the data collection efforts through farm level surveys in only three countries. This decisión was partly also dictated by resource constraints.

accessible at the time of the interview. As discussed in the following section, in all three countries the survey team had to rely heavily on the replacement list to meet the target number of surveys. A large percentage of farmers selected from the above three step process were not interviewed due to several reasons explained below.

The survey was conducted by interviewing the household member that had received the bean seed from the BTD project. The interview was based on a structured questionnaire, which was translated into Spanish (and verbally translated in other local languages in some areas of Guatemala).[3] The questionnaire collected information on the seed recipient (i.e. respondent) and household characteristics, bean production in the season when the BTD seed was planted, and farmers' perception and opinion of the seed quality, varietal characteristics they liked/disliked, and the efficiency and effectiveness of the methods used to distribute the seeds. The field work was carried out in August 2012 in Nicaragua, and in August 2013 in Guatemala and Honduras. The survey was conducted by NITLAPAN of the *Universidad Centro Americana* (UCA) in all three countries, with technical support and supervision by this study's authors.

3.2. Realized sample and data collected

The number of households and communities actually surveyed versus selected, and the replacement rate by regions/departments in all three countries is given in Table 2. Except for Guatemala, the survey team was not able to meet the target sample size of 500 farmers. In Nicaragua the realized rate was 96% (i.e., 480 beneficiary surveys were completed) and in Honduras the realized rate was 88% (i.e., 421 beneficiary surveys completed). To achieve these realized rates, the survey team had to not only replace households within selected communities, but also replace entire communities. For example, in Nicaragua 51% of communities were replaced and overall, 60% of beneficiary households were replaced households in the realized sample. In Honduras, 30% of communities had to be replaced and the overall beneficiary replacement rate was 34% (one of the lowest across three countries). In Guatemala, the community replacement rate was low (25%) but the overall number of beneficiary households replaced was high--60% (Table 2).

The main reasons for not being able to collect the data for the targeted 500 beneficiaries in Honduras were the physical inaccessibility and high risk of traveling to reach communities in the Departments of Santa Bárbara and Atlántida. In the case of Nicaragua several communities had to be replaced, because of: a) high risks for enumerators to travel to reach the selected communities, or b) the community was physically not accessible or c) could not be located in the municipality where it was listed. These were also some of the reasons for community replacement in Guatemala. The relative importance of reasons for high rates of household replacement varied across the countries. But the common reasons documented in all three countries included: d) non-availability of the selected farmer for the interview at the time of the visit (i.e., the farmer not physically present to conduct the interview); e) no one in the community knew the selected farmer (by his/her name); and f) the farmer indicated not receiving any seed. Other reasons cited (but in relatively few cases) were the standard sampling errors and survey response rate issues such as: g) selected farmer not living in the community any more, h) duplications of names in the sampling frame, or i) refusal to participate in the survey. Clearly,

[3] Electronic copies of survey instruments are available upon request from the authors.

some of the reasons (i.e., c, e, f, and h) encountered during the data collection effort have implications on the credibility of the sampling frame provided for sample selection, and by extension, the credibility of the tracking and record keeping system maintained by the project partners. Despite efforts by the project coordinators (MSU, ICTA, Zamorano, DICTA, INTA) to carefully check the beneficiary lists that were provided by their partners as to identify duplicity of names, many duplicated names escaped this 'filter' and were included in the lists received by this study's authors.

Table 2: Number of beneficiaries and communities selected, surveyed and replaced across Regions/Departments of the three focal countries

Region/ Department	Total HHs selected	Total commu-nities selected	Actual # of HHs surveyed	# of commu-nities replaced	# of HHs replaced	Realized rate (actual surveys as a % of selected)	Replacement rate (replaced HHs as a % of realized)
Honduras							
Santa Bárbara	120	24	95	8	46	79%	48%
Yoro	105	21	105	5	35	100%	33%
Lempira	85	17	85	3	17	100%	20%
Atlántida	70	14	36	9	12	51%	33%
Copán	50	10	50	1	15	100%	30%
Ocotepeque	50	10	50	3	20	100%	40%
Intibucá	20	4	20	1	6	100%	30%
Total	***500***	***100***	***441***	***30***	***151***	***88%***	***34%***
Guatemala							
Huehuetenango	275	55	275	5	163	100%	59%
San Marcos	70	14	70	4	32	100%	46%
Quiché	60	12	60	3	35	100%	58%
Totonicapán	45	9	44	0	22	98%	50%
Quetzaltenango	50	10	51	13	48	102%	94%
Total	***500***	***100***	***500***	***25***	***300***	***100%***	***60%***
Nicaragua							
Centro Norte	95	19	99	15	73	104%	74%
Centro Sur	185	37	178	11	79	96%	44%
Las Segovias	45	9	44	5	22	98%	50%
Pacífico Norte	90	18	79	10	58	88%	73%
Pacífico Sur	85	17	80	10	56	94%	70%
Total	***500***	***100***	***480***	***51***	***288***	***96%***	***60%***

4. Results

The results of the data analysis presented in this section provide a picture of the setting, the profile of project beneficiaries and project outcomes across three broad categories: a) socio-economic characteristics (i.e., demographics, sources of income, asset holdings) and the importance of beans in household income, consumption and use of farm resources; b) parcel characteristics and bean production practices in the season when the project seed was planted (e.g., area planted, inputs used, varieties planted, sources of seed planted, grain harvested, how it was used); and c) perceptions and opinion on the quality and quantity of bean seeds received, method of dissemination used, and potential demand for seed. For each characteristic, results are presented at the country level in the main body of the report.[4] For reference purpose, results disaggregated by Departments/Regions in each country are presented in Annex A. The same table number preceded by a letter A is used for the corresponding regional tables in Annex A.

Note that the sampling frame used to select the farmers for this survey was more restrictive in the case of Guatemala and Honduras than in Nicaragua, and thus the results may not be representative of the project beneficiary population for these two countries. In the case of Guatemala and Honduras the focus was on the Feed the Future priority Departments where farmers are likely to be poor and practicing agriculture in more marginal conditions than other parts of the countries where the BTD project was operational. In Nicaragua all Departments were included in the survey, and the results are closer to being representative of the project population that was targeted in year 1.

4.1. Socio-economic characteristics of project beneficiaries, the importance of beans in the household economy, and bean storage and cooking practices prevalent among beneficiaries

4.1.1. Demographic characteristics of beneficiaries and households

Table 3 presents the demographic characteristics of bean farmers that received seeds from the BTD project in the first (Nicaragua) and second year (Guatemala and Honduras) of the project. A typical project beneficiary is in his/her early forties (42 to 43 years old), has completed 3-5 years of formal education, has about 20 years of farming experience and more than 16 years of experience of growing beans (Table 3). A majority of beneficiaries in Honduras and Nicaragua are male (82% in Honduras and 73% in Nicaragua) and head of the household (84% in Honduras and 76% in Nicaragua). As against this, a majority of beneficiaries in Guatemala are women (58%) and spouse of the head of the household (49%). Almost a third of the beneficiaries in Guatemala cannot read or write compared with 9% in Honduras and 12% in Nicaragua (Table 3). Almost one-third of the beneficiaries in Nicaragua, 30% in Guatemala and 18% in Honduras belong to a farmer group or an association (Table 3).

[4] Results are presented at the aggregate country level for comparative analysis purpose. However, we do not conduct any statistical t-test to compare the means across the three countries. Thus, any reference to 'significant' difference in observed values across countries is simply to emphasize the size of absolute difference in the observed values and does not imply a probability-based statistical test of hypothesis.

Membership in a local community seed bank or a local seed producing organization varies across countries, and reflects the institutional presence of such organizations in local communities (Table 3). As expected, the percentage of beneficiaries that reported being members of a community seed bank (CSB) is highest (24%) in Nicaragua where the government is actively promoting the CSB model as a way to increase seed security. As against this scenario, hardly anyone is a member of a local community seed organization in Guatemala, which indicates that a community based seed production model is non-existing in the communities where the BTD project operated in year 2. About 17% of beneficiaries in Honduras are members of a local seed producing organization (e.g., CIAL) (Table 3). Reyes, DeYoung and Maredia (2014) report that 42% of beneficiary farmers in 2012 received seed thru two of the NGOs that work with CIALs. The fact that only 17% of farmers were members of a local seed producing organization confirms that these organizations (i.e., CIALs), as expected, distributed seed not only to member farmers but also to non-members.

In Table 4 we present household (HH) characteristics of beneficiary farmers in terms of size, age and gender composition, land holding, ownership of livestock, type of dwelling, accessibility to credit, markets and road infrastructure, and poverty profile. The profile of an average beneficiary HH in the study area varies significantly across the three countries. On average, the HH size is larger and land holdings smaller in Guatemala than in Honduras and Nicaragua. A typical beneficiary HH in Guatemala has 6-7 members, 52% of whom are female and 12% are less than 5 years old. It cultivated 0.58 manzanas (1 manzana = 7,000 sq. m.) of land across all crops planted on 1.8 parcels in the Segunda 2012 season. A typical HH in Guatemala owns 1.13 tropical livestock units and lives about 6 km from the nearest market and a paved road. Only 10% of HHs in Guatemala had access to running water and 12% had access to electricity.

Table 3. Demographic profile of project beneficiaries

	Guatemala		**Honduras**		**Nicaragua**	
	Mean	N	Mean	N	Mean	N
Average age of the beneficiary (years)	41.7	500	43.5	441	42.8	480
Gender (% of beneficiaries)						
Male	42	500	82	441	73	480
Female	58	500	18	441	27	480
Relationship with the head of the HH (% of beneficiaries)						
Self	47.4	500	83.7	441	76.3	480
Spouse	49.2	500	11.8	441	15.4	480
Son/daughter	3.0	500	3.8	441	7.1	480
Other	0.4	500	0.7	441	1.2	480
Average number of years of education	2.68	500	4.22	441	4.80	480
Percentage of beneficiaries who cannot read/write	32.2	500	8.6	441	11.7	480
Number of years of farming experience	22.16	493	22.98	441	19.80	480
Number of years of experience of growing beans	16.67	493	19.46	441	18.00	480
Membership in a local community seed bank (% of beneficiaries)	0.2	500	16.78	441	24.0	480
Membership in a farmer organization/association (% of beneficiaries)	30.6	500	17.7	441	33.0	480

Source: BTD Project Beneficiary Survey 2012-13

Results are weighted to reflect the share of beneficiary population at the Region/Department level within the country

Table 4. Characteristics of households that received bean seed from the BTD project

	Guatemala		Honduras		Nicaragua	
	Mean	N	Mean	N	Mean	N
Average size of the HH	6.56	500	5.27	441	5.17	480
Percentage HH members – female	51.8	500	49.0	441	47.8	480
Percentage HH members less than 5 years old	12.4	500	12.8	441	dnc	
Number of parcels of agricultural land under HH management:						
Owned	1.56	500	0.83	441	0.87	480
Rented/borrowed	0.21	500	0.24	441	0.43	480
Total	1.77	500	1.07	441	1.3	480
Average land holding (manzanas) \a						
Owned	0.53	500	2.27	403	8.90	480
Rented/borrowed	0.05	500	0.26	403	0.92	480
Total	0.58	500	2.52	403	9.82	480
Percentage of HHs that accessed agricultural credit in the past 12 months	5.0	500	10.0	440	35.0	480
Tropical Livestock Units (TLU) owned (average number of TLUs/HH)	1.13	500	1.76	441	5.13	480
Average distance of the house from the nearest market (km)	6.3	495	13.8	376	16.4	480
Average distance of the house from the nearest paved road (km)	6.3	464	16.0	404	8.5	480
Percentage of HH dwellings with access to:						
well	85.6	500	19.1	441	40.9	480
latrine	12.7	500	87.5	441	88.7	480
bathroom	51.8	500	61.7	441	68.2	480
running water	10.1	500	92.5	441	53.6	480
electricity	12.7	500	62.4	441	66.7	479
Membership by any HH member in a local community seed bank (% of households)	0.2	500	21.0	441	27.1	480
Likelihood that an average beneficiary HH is below the national poverty line (based on the country-specific HH poverty score)	70%		69%		dnc	

Source: BTD Project Beneficiary Survey 2012-13

Results are weighted to reflect the share of beneficiary population at the Region/Department level within the country
dnc=data not collected to calculate this statistic
\a total land holding under HH management corresponds to Segunda/Postrera 2012 for Guatemala and Honduras and Primera 2012 for Nicaragua

Compared with Guatemala, the average HH size is one person smaller in Honduras and Nicaragua, and has a higher proportion of male members. About 12% of HH members in Honduras are below 5 years of age, which is similar to Guatemala. A typical HH in Honduras and Nicaragua had a little over one parcel under its management (i.e., owned, rented and borrowed) in the season when the survey was conducted, compared with 1.77 parcels in

Guatemala. However, the average HH land holding across these parcels is significantly different across the three countries. In Nicaragua, the average land holding per HH across all parcels under its management was 9.8 manzanas, which is almost 4 times bigger than the average total land holding reported in Honduras (2.5 manzanas), which in turn, is 4 times bigger than the average land holding per HH reported in Guatemala (0.58 manzanas) (Table 4).

Compared to Guatemala, a typical HH in Honduras and Nicaragua lives further away from markets and paved roads, but a higher percentage of HHs in these two countries has access to basic amenities such as electricity and water compared with Guatemala (Table 4). More than a third HHs in Nicaragua had accessed credit in the past 12 months compared with 10% in Honduras and 5% in Guatemala. The probability that an average beneficiary HH surveyed is below the national poverty line is about 70% in both Guatemala and Honduras. Data to estimate such probability was not collected in Nicaragua.

The vast differences in HH characteristics such as 'access to land,' ownership of assets, access to infrastructure and amenities have implications on the potential role agriculture can play in the development strategy, and technology development challenges across these countries. In general, the socio-economic profile of beneficiary HHs in Guatemala appear to be more concentrated on the disadvantaged and more challenging spectrum of the distribution relative to the average HH beneficiary in the other two project countries.[5] Further, key informants in Guatemala also confirmed this since they mentioned that many of the beneficiary communities and farmers were selected from a list of the poorest municipalities that are included in the 'Hambre Cero" government program, which include the poorest and most needy smallholder farmers in the country (Reyes, DeYoung and Maredia 2014)

4.1.2. Importance of beans in the share of household resources and income contribution

Despite the differences in the socio-economic and demographic profiles of beneficiary HHs, they share a similar agricultural profile when it comes to the importance of maize and beans in the farming systems. Across all three countries, maize and beans are reported as the two most important crops in terms of total area planted, purchased inputs devoted and family labor invested (Table 5). In Honduras and Guatemala, beans is ranked as the top three most important crops in terms of area, input and labor investment by more than 70% of surveyed HHs, and in Nicaragua bean is ranked as the top three by more than 40% of surveyed HHs. Horticultural crops in Guatemala, Coffee in Honduras and Pasture in Nicaragua come distant third in importance in terms of area planted and purchased inputs and HH labor invested (Table 5).

Table 6 reports the sources and diversity of household income of project beneficiaries in the three study countries. In Honduras and Nicaragua, field crop sales are reported as the major source of HH income by more than three-quarters of the surveyed beneficiaries. Wages/salaries from agricultural sector is the second most important source of HH income with close to 40% of HHs deriving income from that source in Honduras and Nicaragua. In contrast, in Guatemala more than 70% of beneficiary HHs reported agricultural wages as their primary source of

[5] It is important to point out that this difference in the profile of beneficiary households may be also accentuated by the fact that in Guatemala the focus of the survey was only on the FTF Departments.

income. Income from field crops sale comes distant second with 32% of beneficiaries reporting that as a source of their HH income. Some other notable sources of income reported are income from horticulture crops sale in Guatemala, dairy and livestock product sale and wages/salaries from non-farm sector in Nicaragua, and other agricultural activities in Honduras (Table 6). A small but significant percentage of HHs also reported receiving remittance income in the past 12 months. A typical project beneficiary HH had 1 to 3 sources of income, with the average being 1.8 in Honduras, 2.1 in Guatemala and 2.5 in Nicaragua. In other words, HHs in Honduras, on average are least diverse in terms of number of income sources, and HHs in Nicaragua are most diverse (Table 6).

Table 5. Importance of different crops in household's farm operation in terms of total area planted, purchased inputs devoted, and family labor contributed as reported by farmers

	Guatemala		Honduras		Nicaragua	
	Crop \a	N	Crop \a	N	Crop \a	N
Three most important crops on the HH's farm in terms of total area planted:						
First	Maize (85%)	500	Beans (80%)	441	Maize (71%)	480
Second	Beans (72%)	500	Maize (64%)	441	Beans (42%)	480
Third	Horticulture crops (16%)	500	Coffee (22%)	441	Pasture (28%)	480
Three most important crops on the HH's farm in terms of family labor devoted:						
First	Maize (83%)	500	Beans (79%)	441	Maize (72%)	480
Second	Beans (72%)	500	Maize (64%)	441	Beans (44%)	480
Third	Horticulture crops (17%)	500	Coffee (22%)	441	Pasture (17%)	480
Three most important crops on the HH's farm in terms of purchased inputs devoted:						
First	Maize (83%)	500	Beans (75%)	441	Maize (72%)	480
Second	Beans (70%)	500	Maize (60%)	441	Beans (41%)	480
Third	Horticulture crops (16%)	500	Coffee (22%)	441	Pasture (17%)	480

Source: BTD Project Beneficiary Survey 2012-13

\a % of HHs ranking a crop in top three is reported in parenthesis

The role of bean grain sales in HH income varies across the three countries. It contributes significantly more to an average HH's income in Nicaragua and Honduras compared to Guatemala as indicated by the high percentage of HHs that report bean grain sales as contributing more than 25% of HH income (58% in Nicaragua and 46% in Honduras versus only 9% in Guatemala) (Table 6). The self-reported average share of total income derived from bean grain sales was estimated based on the mid-point of the quartile distribution groups, and it comes to about 16% in Guatemala, 31% in Honduras and 35% in Nicaragua. This crude metrics of percentage share of bean grain sales in HH income measures not only the relative importance of beans in HH income generation, but also the 'commercialization' of smallholder bean production in the country, and indicates that in all three countries a majority of project beneficiaries targeted are producing beans for home consumption and not for sale. However, within this generalized conclusion, the three countries fall on a wide range of self-reported importance of bean grain sales in HH income. For example, the average contribution of bean grain sales in HH income is lowest in Guatemala (16%) with more than 90% beneficiaries reporting bean grain sales'

contribution to HH income to be less than 25%, whereas, it is more than double in Honduras (31%) and Nicaragua (35%) (Table 6).

Table 6. Sources and diversity of household income and percentage of HH income derived from bean grain sale (self-reported by respondents)

	Guatemala		Honduras		Nicaragua	
	Mean	N	Mean	N	Mean	N
Percentage of HHs reporting following sources of income in the past 12 months:						
Field crop sales	31.7	500	77.2	441	79.6	480
Horticulture crop sales	21.3	500	6.8	441	9.2	480
Dairy product sales	7.1	500	6.1	441	29.0	480
Livestock sales for meat	15.2	500	5.0	441	21.7	480
Other agricultural activities	7.8	500	18.3	441	9.5	480
Renting/leasing land or farm equipment	3.1	500	0.6	441	7.6	480
Wages/salaries from agricultural labor	70.2	500	39.4	441	39.7	480
Wages/salaries from non-agriculture sector	9.2	500	10.7	441	22.9	480
Income from non-farm business	20.2	500	9.3	441	13.2	480
Percentage of HHs receiving remittance income in the past 12 months	8.4	499	6.6	440	14.1	480
Diversity of income (average number of sources of HH income reported)	2.1	500	1.8	441	2.5	480
Percentage of HHs reporting the following percentage of HH income from bean grain sales:						
Zero	dnc	500	dnc	441	2.5	480
Less than 25%	90.6	500	53.0	441	39.8	480
25-50%	6.6	500	26.9	441	32.7	480
50-75%	1.4	500	11.3	441	15.0	480
More than 75%	1.0	500	7.5	441	10.0	480
Don't know/no response	0.0	500	1.3	441	0.0	480
Reported share of total income derived from bean grain sales, average across all HHs (%)	15.6	498	31.3	436	34.6	480

Source: BTD Project Beneficiary Survey 2012-13
Results are weighted to reflect the share of beneficiary population at the Region/Department level within the country
dnc=data not collected

4.1.3. Importance of beans in household food consumption and bean cooking practices

Table 7 presents the reported share of own production in meeting the HH bean consumption needs, and thus how 'bean secured' the beneficiary HHs are. On average, a typical project beneficiary HH in Honduras and Nicaragua is able to meet 63% of its bean consumption from own production. This share is 39% in Guatemala, which indicates that a majority of targeted

project beneficiaries were 'bean insecured' as measured by the ability to meet bean consumption from own production (Table 7). More than 40% of beneficiaries in Guatemala reported meeting less than 25% of their HH bean consumption need from own production. As against this, more than 45% of beneficiaries in Honduras and Nicaragua reported meeting more than 75% of their HH bean consumption need from own production (Table 7). The smaller production capacity (i.e., land holdings) and larger HH size in Guatemala potentially explains the higher bean insecurity compared to other two countries.

Table 7. Importance of beans derived from own production in meeting the household food consumption needs

	Guatemala		Honduras		Nicaragua	
	Mean	N	Mean	N	Mean	N
Percentage of HHs reporting the following percentage of total bean consumption satisfied by own production:						
Less than 25%	41.4	500	10.4	441	13.3	480
25-50%	29.0	500	20.6	441	19.4	480
50-75%	11.0	500	22.9	441	20.2	480
More than 75%	18.0	500	45.8	441	47.1	480
Don't know	-	500	0.3	441	-	480
Reported share of total bean consumption satisfied from own production, average across all HHs (%)	38.7	497	62.9	441	62.8	480
Percentage of HHs reporting the following duration their bean grain reserves typically last after harvest:						
Less than one month	15.6	500	2.0	441	3.3	480
1-3 months	24.2	500	10.4	441	7.9	480
3-6 months	29.0	500	22.7	441	10.8	480
6-9 months	9.4	500	31.3	441	10.8	480
Until the harvest in the following season	19.0	500	30.0	441	65.4	480
Don't know	2.8	500	3.6	441	1.7	480
Percentage of HHs reporting the following frequency of bean purchase for consumption after the grain reserves from own production is over:						
Never	18.6	500	35.6	441	53.7	480
Every day	0.4	500	3.0	441	3.1	480
Few times per week	20.6	500	10.0	441	6.9	480
Once a week	44.6	500	26.8	441	12.1	480
2-3 times per month	10.0	500	12.9	441	9.8	480
Once a month	3.6	500	8.6	441	10.6	480
Don't know	2.2	500	3.2	441	3.3	480

Source: BTD Project Beneficiary Survey 2012-13
Results are weighted to reflect the share of beneficiary population at the Region/Department level within the country

The difference in household bean security or bean 'self-sufficiency' across the three countries is also reflected in the difference in the duration the bean grain reserves typically last after harvest. A significantly higher percentage of beneficiary HHs in Guatemala (i.e., about 40%) report their bean grain reserves lasting not more than 3 months. As against this, a significantly more beneficiary HHs in Nicaragua (about 75%) and Honduras (about 60%) reported their bean grain

reserves lasting more than six months or until the following harvest (Table 7). After the grain reserves are over, a majority of beneficiaries in Guatemala and Honduras reported purchasing beans once a week (45% and 27%, respectively) or more frequently than that (21% and 13%, respectively). In Nicaragua, a majority of beneficiaries reported purchasing beans once a week (12%) or less frequently than that—10% reported purchasing beans 2-3 times a month and 11% reported purchasing beans once a month (Table 7). The percentage of beneficiaries that never purchase beans for home consumption varies significantly across the countries—it is 54% in Nicaragua, 36% in Honduras and 19% in Guatemala. A majority of these non-purchasers of beans are households that reported that their bean grain reserves typically last more than six months or until the next harvest. But about 5% of households in Guatemala and 2.5% in Honduras that report not purchasing beans for consumption also report their bean grain reserves lasting less than three months. These are the truly bean unsecured HHs that do not consume beans throughout the year either because of inaccessibility or unaffordability of beans, especially during the dry season, when the bean price is highest.

In Table 8, we present the bean consumption and cooking practices self-reported by project beneficiaries in Guatemala and Honduras, where these data were collected.[6] A typical beneficiary HH cooks beans between 2-3 times per week in both countries. On average, the quantity of beans cooked by a typical HH is about 4.68 lbs/week in Guatemala and 5.88 lbs/week in Honduras. This translates to 0.17 lbs of self-reported bean consumption per person per day in Honduras, which is 50% more than the estimated 0.11 lbs/person/day in Guatemala (Table 8).

The average time the beans are cooked vary significantly across the two countries. On average, a beneficiary HH in Guatemala cooked beans for two and half hours each time it cooked beans, almost twice the time reported in Honduras. On a per pound basis, the average time beans are cooked comes to 96 minutes in Guatemala and only 36 minutes in Honduras, even though more percentage of HHs reported soaking beans before cooking in Guatemala (25%) than in Honduras (17%), and the most common fuel used to cook beans is wood in both the countries. The explanation for this significant difference in cooking time reported by the two countries could be due to cultural habits and preferences of how beans are consumed, the geography of two countries (i.e. difference in the altitude), the genetics of bean varieties, a combination of all these factors, or likely, a bias in the respondent's answers. Further studies are needed to understand what factors contribute to these vast differences in cooking time reported across Guatemala and Honduras.

4.1.4. Post-harvest bean storage practices and pest problems

Project beneficiaries in Guatemala and Honduras were also asked about their post-harvest bean storage practices and bruchid pest problem. As reported in Table 9, the relative importance of different storage methods differs between the two countries, but storing beans in polyethylene or jute sacks is the most common method used by project beneficiary farmers in both the countries. In Honduras, metal silos and metal drums were reported as being used by 12.5% and 7.3% of bean farmers, respectively. In contrast, only 3.6% and 1% of farmers reported using these

[6] The surveys in Guatemala and Honduras were conducted one year later than in Nicaragua, and several questions related to post-harvest practices, bean consumption, cooking practices, and seed purchase behavior were added in these latter surveys. Hence for many of these characteristics we only have data from Guatemala and Honduras.

methods in Guatemala, respectively. Almost 6% of farmers in Guatemala reported not using any method, most likely due to not having enough bean grain reserves to store (i.e., HHs consuming the beans soon after the harvest).

Table 8. Quantity and frequency of bean consumption and cooking practices reported by project beneficiary households

	Guatemala		Honduras		Nicaragua	
	Mean	N	Mean	N	Mean	N
Average number of times a HH cooked beans for home consumption in the last 7 days	2.7	498	2.8	440	dnc	
Average quantity of beans cooked by a typical HH over the past 7 days (lbs)	4.68	496	5.88	436	dnc	
Average quantity of beans consumed per person per day (lbs/day/person)\a	0.11	496	0.17	435	dnc	
Average time a typical HH cooked beans for home consumption each time it cooked beans (minutes)	150.0	486	65.0	436	dnc	
Average time HH spent cooking beans per unit of weight (minutes/lbs)	95.9	478	36.4	433	dnc	
Percentage of HHs that soak beans before cooking	25.0	500	17.0	440	dnc	
Main source of energy used for cooking beans (% of HHs)						
Wood	97.0	499	97.0	440	dnc	
Propane gas tank	3.0	499	2.3	440	dnc	
Electricity	-	499	0.7	440	dnc	

Source: BTD Project Beneficiary Survey 2012-13
Results are weighted to reflect the share of beneficiary population at the Region/Department level within the country
dnc=data not collected
\a Assumes that all beans cooked is typically consumed by household members and there is no wastage.

Close to 50% of farmers in both the countries report bruchid problem in stored beans (Table 9). Among those that report this problem, 14% in Honduras and 20% in Guatemala don't use any method to control this pest. Forty seven percent in Honduras and 55% in Guatemala report using chemical control method of applying fostoxin or an insecticide, and the remainder of the HHs use homemade remedies or other methods for controlling bruchids. When asked about a hypothetical situation of farmers having 100 bags of beans at the harvest time, how many bags they would lose at the end of one, three and six months due to bruchids if they did not use any method to control it, the average number of bean bags they would lose was speculated to be 15 at the end of one month, 36 at the end of 3 months and 48 at the end of six months in Guatemala. The perceived loss of bean grain due to bruchids was higher among farmers in Honduras. They report that on average they would lose 28% of their stored beans at the end of one month, 50% at the end of 3 months and 75% at the end of six months, if they did not use any method to control the bruchids. These results indicate the severity of this problem, at least as perceived by the farmers, and the need to come up with low cost options to control the pest and to reduce the bean grain loss, especially in Honduras where more farmers store their grains for a longer period of time after harvest.

Table 9. Post-harvest bean storage practices and bruchid problem reported by the project beneficiary bean farmers

	Guatemala		Honduras		Nicaragua	
	Mean	N	Mean	N	Mean	N
Percentage of HHs using the following method of storing beans:						
Metal silos	3.6	500	12.5	441	dnc	
Metal drum	1.0	500	7.3	441	dnc	
plastic container with lid	5.0	500	1.8	441	dnc	
plastic container without lid	2.2	500	0.2	441	dnc	
sacks (polythylene or jute)	58.4	500	72.3	441	dnc	
Plastic bags	18.2	500	1.8	441	dnc	
No method (don't store beans)	5.8	500	1.6	441	dnc	
Other methods	5.8	500	2.3	441	dnc	
Percentage of HHs reporting bruchid problem in stored beans	49.6	500	54.4	440	dnc	
Among those that report the problem, percentage of HHs using the following method to control bruchid damage on beans:						
Nothing	19.8	247	14.2	240	dnc	
Apply fostoxin/insecticide	54.7	247	47.1	240	dnc	
Use other homemade remedies	25.5	247	38.8	240	dnc	
Farmers' opinion on the consequences of bruchid problem if s/he did not use any method to control the pest as measured by percentage of bean grain lost at the end of... (%)						
One month	14.6	248	28.0	163	dnc	
Three months	36.4	248	50.0	163	dnc	
Six months	47.6	248	75.0	163	dnc	

Source: BTD Project Beneficiary Survey 2012-13
Results are weighted to reflect the share of beneficiary population at the Region/Department level within the country
dnc=data not collected

4.2. Parcel characteristics, varieties planted, and bean production practices and outcomes in the season when the project seed was planted

4.2.1. Characteristics of parcels on which project seed was planted

The results presented in Section 4.1 provide the context to understand the setting of the BTD project intervention in terms of the overall profile of beneficiaries, their household characteristics, and their farming practices. In this section we provide the size and scale of bean production and the context of farming practices on parcels on which the project seed was planted. As a start, Table 10 provides information on the season in which the project seed was planted, problems encountered, and the size/scale of bean farming among project beneficiary households. Since the survey in Nicaragua preceded by one year, it is not surprising that the seasons in which the project seed was planted by the first year cohort of beneficiaries surveyed correspond to agricultural year 2011-12, and in Guatemala and Honduras they correspond to agricultural year 2012-13. A majority of beneficiaries in Nicaragua (68%) reported planting the

bean seed received from the BTD project in the Postrera 2011 season. In Guatemala and Honduras, which represents the sample of the second cohort of beneficiaries, the project seed was planted more or less evenly in the Primera 2012 and the Postrera 2012 seasons. In Honduras about 15% of sampled beneficiaries also reported planting the seed in the Apante 2012-13 and Primera 2013 seasons (Table 10).

Table 10. Information about the season in which the project seed was planted by surveyed beneficiaries

	Guatemala		Honduras		Nicaragua	
	Mean	N	Mean	N	Mean	N
Season in which the project seed was planted (% of farmers)						
Primera 2011	-	500	-	441	5.2	480
Postrera 2011	-	500	-	441	67.9	480
Apante 2011-12	-	500	-	441	18.8	480
Primera 2012	46.8	500	31.1	441	8.1	480
Postrera 2012	40.8	500	37.0	441	-	480
Apante 2012-13	8.2	500	14.7	441	-	480
Primera 2013	4.0	500	15.4	441	-	480
Did not plant in any season	0.2	500	1.8	441	-	480
Percentage of HHs reported receiving seed from the project more than one time	0.0	500	1.4	441	0.4	480
Percentage of households reporting growing beans on the following numbers of parcels in that season						
none	0.2	500	1.8	441	0.4	480
one	91.6	500	85.3	441	62.9	480
two	7.0	500	11.3	441	32.3	480
three or more	1.2	500	1.6	441	4.4	480
Average number of parcels of agricultural land planted to beans in the season when project seed was planted	1.1	500	1.1	441	1.4	480
Total area cultivated to beans (manzana/HH)\a	0.11	499	0.44	433	1.37	478
Total area cultivated across all crops and all parcels in the season when project seed was planted (manzana/HH)\a	0.78	479	2.00	433	7.70	480
Share of bean crop in total area cultivated by a HH (%)	13%		22%		18%	
Percentage of farmers experiencing the following problems more in the season when project seed was planted than in the previous 2 years						
Insects	49.7	479	53.4	432	40.2	480
Disease	29.6	479	50.7	432	29.9	480
Drought	28.4	479	38.2	432	18.4	480
too much rain	61.8	479	20.8	432	58.2	480

Source: BTD Project Beneficiary Survey 2012-13

Results are weighted to reflect the share of beneficiary population at the Region/Department level within the country

\a For Nicaragua the area estimates correspond to project seed planted in Primera 2012

Very few beneficiaries reported receiving seeds from the project more than one time, which is consistent with the design of the BTD project. Key informants in Guatemala and Honduras also reported that a small share of farmers received seed from the project more than one time (Reyes, DeYoung and Maredia 2014). On average beneficiary farmers cultivated 1.1 parcels of beans in Guatemala and Honduras, and 1.4 parcels of beans in Nicaragua in the season in which the project seed was planted. A majority of beneficiaries only planted one parcel of land with beans in all three countries.

The average total area planted to beans per HH in the season in which the project seed was planted was 0.11 manzanas in Guatemala, 0.44 manzanas in Honduras and 1.37 manzanas in Nicaragua. The significant difference in the total bean area planted per HH is reflective of the relative size of total land holdings across the three countries. In terms of percentage share, the total bean area per HH represents about 13% of total area cultivated across all crops per HH in Guatemala, 22% in Honduras and 18% in Nicaragua (Table 10). Thus, in Guatemala, beans have even a smaller share in the small land holdings than in the other two countries.

Compared to previous two years, farmers in Guatemala reported experiencing more insects (50% of farmers) and too much rain (62% of farmers) in the season when the project seed was planted (Table 10). Excessive rain was also cited as a major problem in Nicaragua by 58% of farmers. In the case of Honduras, more than 50% of farmers reported experiencing more insect problem and diseases in the season when the project seed was planted than the previous two years. Drought was also reported as a problem in Honduras by 38% of farmers.

Table 11 presents characteristics of parcels on which bean seeds received from the BTD project were planted. It gives the profile of the parcel in terms of physical characteristics (slope, presence of rocks, type of soil) and also land tenure status, gender of the person responsible of the farming operation on that parcel, and whether bean was intercropped or not. In general, a typical bean parcel was most commonly characterized by the farmer across the three countries as having medium slope, some rocks, clay or sandy soils, owned by the HH, and managed by a male member of the HH (Table 11). Bean was intercropped on 18% of parcels in Honduras, 11% in Guatemala, and 6% in Nicaragua. A significant number of parcels on which beans were planted in Honduras and Nicaragua were rented-in or borrowed from others (Table 11).

The average size of the bean parcel on which project seed was planted varied from 0.10 manzana in Guatemala to 0.4 manzana in Honduras and 0.63 manzana in Nicaragua (Table 12). After adjusting for intercropping, the average bean area planted with seeds received from the BTD project came to 0.09, 0.36 and 0.61 manzana, respectively in Guatemala, Honduras and Nicaragua (Table 12). This represents 84% share in total area planted to beans in that season per HH in Guatemala, 81% share in Honduras, and 41% share in Nicaragua.

A majority of farmers in all three countries reported applying chemical fertilizers (Table 12). Other inputs used on the bean parcels planted with project seed include fungicide (88% of parcels in Nicaragua, 40% in Honduras and 16% in Guatemala) and insecticide (75% in Nicaragua, 54% in Honduras and 34% in Guatemala). Almost 19% of parcels were reported to be irrigated in Honduras, which is correlated with a similar percentage of beneficiaries planting

the project bean seed in Apante season in Honduras (Table 10). About 2% of parcels are reported to be irrigated in Nicaragua, which is surprisingly low, since almost 19% of beneficiaries planted the project seed in Apante season (Table 10).

Table 11. Characteristics of parcels on which bean seeds received from the project were planted

	Guatemala		Honduras		Nicaragua	
	Mean	N	Mean	N	Mean	N
Percentage of parcels with the following slope:						
flat	26.0	481	32.3	449	27.9	484
medium	45.0	481	43.2	449	42.8	484
steep	29.1	481	24.5	449	29.3	484
Percentage of parcels with the following soil quality:						
sand	22.0	478	50.1	449	27.1	484
silt	20.3	478	11.6	449	28.7	484
clay	55.0	478	35.0	449	43.5	484
don't know	2.7	478	3.3	449	0.7	484
Percentage of parcels with the presence of rocks:						
none	34.5	480	29.6	449	35.7	484
some	52.2	480	49.9	449	46.7	484
a lot	13.3	480	20.5	449	17.6	484
Percentage of parcels with the following land tenure status:						
owned	86.1	481	69.7	449	60.5	484
rented in	8.3	481	18.9	449	21.3	484
shared	-	481	0.2	449	3.3	484
borrowed	5.6	481	11.1	449	13.0	484
government land	-	481	-	449	1.7	484
other	-	481	-	449	0.2	484
Percentage of parcels on which bean was inter-cropped	11.2	481	18.0	449	5.8	484
Gender of the person responsible for the parcel (%)\a						
male	74.2	526	94.2	449	88.4	69
female	25.8	526	5.8	449	11.6	69

Source: BTD Project Beneficiary Survey 2012-13

Results are weighted to reflect the share of beneficiary population at the Region/Department level within the country

\a For Nicaragua this statistic only reflects Primera 2012 season

The total cost of inputs applied on bean parcels is also reported in Table 12 as an average across those that provided these estimates (which are a sub-set of those that reported using the inputs). Since the number of observations is different and these estimates exclude parcels with zero costs, they are not comparable across categories. But based on the percentage farmers using chemical fertilizer and the cost reported, it will have a major share in total cost of inputs when aggregated across parcels. The cost of inputs is higher in absolute dollar value in Nicaragua, but on a per manzana basis, the average cost of inputs may be higher in Honduras compared to other countries.

Table 12. Bean area planted and use of inputs on parcels on which bean seeds received from the project were planted

	Guatemala		Honduras		Nicaragua	
	Mean	N	Mean	N	Mean	N
Total area planted to beans in the season when project seed was planted (after adjusting for intercropping) (manzana/HH)	0.11	499	0.44	433	1.48	478
Average size of the bean parcel on which project seed was planted (manzana)	0.10	487	0.40	449	0.63	484
Average bean area planted in parcel where project seed was planted (after adjusting for intercropping) (manzana)	0.09	487	0.36	449	0.61	484
Share of bean area planted with project seed in total area cultivated to beans in that season (%)	84%		81%		41%	
Percentage of parcels planted with project seed that:						
Were irrigated	9.6	481	18.7	449	2.1	484
Applied insecticide	34.3	481	54.3	449	74.8	484
Applied fungicide	16.0	481	40.3	449	88.2	484
Applied chemical fertilizer	70.0	481	65.3	449	74.8	484
Among those that used and reported the cost, average amount of money spent on the following inputs used on the bean crop (US$) \a \b						
Chemical fertilizer	17.2	397	28.5	278	45.8	53
Herbicide	5.4	57	9.2	173	18.8	58
Chemical pesticides	5.6	116	13.3	235	24.5	51
Seed	--	1	3.9	9	--	0
Hired labor	19.7	51	43.8	184	47.9	41
Percentage of beneficiary farmers reporting that the seed planted was certified \a	62.4	500	93.5	449	0.0	69

Source: BTD Project Beneficiary Survey 2012-13

Results are weighted to reflect the share of beneficiary population at the Region/Department level within the country

\a For Nicaragua this statistic only reflects Primera 2012 season

\b Local currencies were converted into US$ using the following rate (prevalent at the end of 2011 and 2012): 1 US$ = 7.7 Quetzales for Guatemala, 1 US$=19.3 Lempiras for Honduras and 1 US$ = 22.29 Cordobas for Nicaragua

4.2.2. Bean varieties planted and opinion on varietal characteristics by project beneficiaries

Table 13 lists the names of varieties of seeds received from the BTD project as reported by the beneficiaries, which mirrors the list of varieties multiplied and disseminated as reported by the project partners (Reyes, DeYoung and Maredia 2014). In Guatemala, more than 75% of cohort 2 beneficiaries reported receiving ICTA Hunapú and 13% reported receiving ICTA Ligero. Similarly, in Nicaragua a vast majority (78%) of cohort 1 beneficiaries reported receiving INTA Rojo, followed by INTA Sequía (11%) and INTA Matagalpa (4%). In Honduras, there is no one dominant variety reported by the beneficiaries, which is consistent with the strategy adopted by the project country partners to multiply and disseminate seeds of several varieties that were bred

both through conventional breeding and through participatory breeding methods. The top three varieties reported by the cohort 2 beneficiaries surveyed from the seven regions in Honduras were Amadeus 77 (27%), Cedrón (15%) and Deorho (11%). A significant percentage of beneficiaries in all three countries (2% in Nicaragua, 10% in Guatemala and 20% in Honduras) reported not knowing the name of the variety of seed planted that they received from the project distribution system. This is quite surprising (and worrying), since the name of the variety should be the most important information that should have been conveyed to farmers when distributing the seed, as it represents an essential element of creating 'demand' for seeds of improved varieties and the sustainability of the seed system. Further, the name of the variety was included in the label of each seed bag, which makes this even more surprising. Perhaps many farmers did not receive the seed in the project bag (with the label).

Table 13. Name of varieties received from the BTD project's distribution system as reported by the beneficiaries

	Guatemala		Honduras		Nicaragua	
	Mean	N	Mean	N	Mean	N
Percentage of bean parcels planted with seeds of following varieties:						
ICTA Hunapú	76.4	500	--		--	
ICTA Ligero	13.2	500	--		--	
ICTA Petén	0.4	500	--		--	
Don't know the name	10.0	500	19.6	449	1.9	484
Amadeus 77	--		26.5	449	--	
Cedrón	--		14.9	449	--	
Deorho	--		11.1	449	--	
Macuzalito	--		4.9	449	--	
Tío Canela 75	--		4.2	449	--	
Chepe	--		4.0	449	--	
Carrizalito	--		3.3	449	--	
Cardenal	--		3.3	449	--	
Other	--		8.1	449	4.3	484
INTA Rojo	--		--		78.3	484
INTA Matagalpa	--		--		4.1	484
INTA Sequía	--		--		11.4	484
All	100.0	500	100.0	449	100.0	484

Source: BTD Project Beneficiary Survey 2012-13

A high percentage of beneficiaries (in the range of 70-88%) expressed their interest in planting the variety of seed they had received from the BTD project in the next season (Table 14). Among those that expressed such interest, 80-90% plan to either increase the area planted to a given variety in future or maintain the same area as planted in the season when project seed was planted. This expression of interest to continue to grow the variety at the same or augmented level renders support to the underlying idea of distributing small quantities of seed which can then be multiplied, saved and expanded to more area on one's own farm by the farmer him/herself. Further, it indicates that farmers were satisfied with the varieties received and their performance since farmers will continue to adopt these varieties.

Table 14. Perception and opinion on varietal characteristics liked and disliked and plan for planting the variety in the next season \a

	Guatemala		Honduras		Nicaragua	
	Mean	N	Mean	N	Mean	N
Percentage of farmers who plan to grow the variety received in the next season	**70.4**	**500**	**75.9**	**449**	**88.4**	**69**
Percentage of farmers that plan to change the area planted to a given variety in future:						
Increase	38.6	394	49.0	357	49.2	61
Decrease	3.6	394	2.8	357	4.9	61
no change	45.7	394	44.0	357	41.0	61
don't know	12.2	394	4.2	357	4.9	61
Top two characteristics most liked about the variety received from the BTD project:						
First	Cooking quality/ taste (52%)	481	Good yield (72%)	449	Good yield (81%)	69
Second	Good yield (47%)	481	Cooking quality/ taste (29%)	449	Resistance to disease (32%)	69
Percentage of farmers that reported no characteristics that they disliked	55.4	481	59.9	449	56.5	69
Among those that reported, top two characteristics most disliked about the variety received from the BTD project:						
First	Susceptible to diseases (20%)	214	Susceptible to diseases (37%)	180	Low market price (43%)	23
Second	Susceptible to insects (17%)	214	Low yield (20%)	180	Late maturity (26%)	23
Farmers' perception on cooking time of the variety received from the BTD project (percentage of respondents)						
fast or very fast	67.5	462	85.2	364	dnc	
Regular	11.0	462	8.5	364	dnc	
slow or very slow	5.8	462	6.0	364	dnc	
don't know	15.6	462	0.3	364	dnc	

Source: BTD Project Beneficiary Survey 2012-13
Results are weighted to reflect the share of beneficiary population at the Region/Department level within the country
\a For Nicaragua the results reported in this table only reflect beneficiaries that planted the project seed in the Primera 2012 season

Good yield was overwhelmingly cited as one of the top two characteristics farmers liked about the variety they had received from the project (Table 14). More than 80% of beneficiaries in Nicaragua, 72% of beneficiaries in Honduras and 47% of beneficiaries in Guatemala indicated 'good yield' as one of the characteristics they liked about the project varieties they had planted. Good cooking quality/taste and resistance to diseases were cited as other two characteristics liked by the beneficiaries. In Guatemala, good cooking quality and taste of varieties obtained from the project received high marks from more than 50% of beneficiaries (Table 14). The latter

is not surprising for Guatemala since most beneficiary farmers were poorer and more disadvantaged than farmers in Honduras or Nicaragua, and farmers in Guatemala reported that a small share of their total income came from bean grain sales, suggesting that they produce beans mostly for own consumption. Thus, for these farmers, taste and cooking qualities would be more important than for farmers in Honduras and Nicaragua.

When asked about the varietal characteristics they disliked, 55-60% of beneficiaries across the three countries could not cite any traits that they did not like, which points to the success of the bean research program in developing varieties that meet the trait preferences of farmers without introducing any features that are disliked. Among those who reported characteristics of the varieties disliked, the top three cited varietal traits were susceptibility to diseases and insects, low market price and late maturity (Table 14). Low market price is generally an issue with red bean varieties since consumers demand light red grain. The fact that farmers reported low market price as one of the characteristics they disliked suggest that there is still a need to develop improved varieties with better market value (i.e., color) than the ones currently available. This is not surprising since, although most of the varieties distributed have better market value (i.e., light-red color) than older IVs, these still do not have the preferred market color. Low yield was also cited as one of the characteristics not liked by 20% of beneficiaries in Honduras.

4.2.3. Quantity and sources of project seed planted and production outcomes realized

The quantity of project seed received and planted by the beneficiaries surveyed varies significantly across the country and reflects the different socio-economic and farming characteristics of target population in each country. Table 15 shows the distribution of quantity of seeds planted that was received from the project across the three countries, and not surprisingly the distribution is skewed to the lower end in the case of Guatemala and to the upper end of the distribution in the case of Nicaragua as they represent the two extremes in terms of land size holding reported by project beneficiaries. The average quantity of project seed a typical HH planted was 5 lbs in Guatemala, 27 lbs in Honduras and 50 lbs in Nicaragua (Table 15). The median value in Nicaragua is 20 lbs, which suggests that the average is highly influenced by a few observations of beneficiary farmers that reported planting more than 100 lbs of seed.

Table 15 also lists the sources of project seed received as reported by the farmers. In Guatemala, almost half of the farmers surveyed in the five FTF Departments reported receiving the seed from MAGA (*Ministerio de Agricultura, Ganadería y Alimentación*), another quarter reported receiving it from the local municipal office, and 16% received the seed from SOSEP (*Secretaría de Obras Sociales de la Esposa del Presidente*). In Honduras, the list of sources of seed received as reported by the farmers is long, which is again consistent with the seed distribution model used in that country (Reyes, DeYoung and Maredia 2014). However, among the long list of institutions/entities that were involved in seed distribution, DICTA/SAG (*Dirección de Ciencia y Tecnología Agropecuaria/Secretaría de Agricultura y Ganadería*) was cited as the source of seed by more than 40% and CIALs were cited by 20% of beneficiary farmers surveyed in the 7 Departments (Table 15). In Nicaragua, 100% of beneficiary farmers reported receiving the seed from a community seed bank, which was the only model used for seed dissemination by the BTD project in that country. About 2% of beneficiary farmers in Guatemala and Honduras reported ‘don’t know’ when asked for the source of the project seed they had received. Again, this is a

surprising result and points to the need for a more effective strategy of communicating to the beneficiaries the source of the seed they are receiving and its properties (and name).

Table 15. Quantity of planted seed and main sources of seed received from the BTD project

	Guatemala		Honduras		Nicaragua	
	Mean	N	Mean	N	Mean	N
Quantity of BTD project seed planted (lbs/parcel)	5.2	500	26.1	449	49.3	484
Quantity of BTD project seed planted (lbs/HH)	5.3	491	27.0	432	50.6	473
Percentage of HHs planting the following quantity of project seed:						
Less than 5 lbs	37.1	491	1.4	432	0.6	473
5-9 lbs	39.9	491	2.8	432	0.6	473
10-14 lbs	22.8	491	11.3	432	8.2	473
15-19 lbs	0.0	491	1.9	432	1.1	473
20-24 lbs	0.2	491	27.1	432	41.4	473
25-39 lbs	0.0	491	38.4	432	3.6	473
40-59 lbs	0.0	491	10.9	432	17.1	473
60-99 lbs	0.0	491	2.8	432	19.0	473
100-200 lbs	0.0	491	3.5	432	5.9	473
200-499 lbs	0.0	491	0.0	432	2.1	473
More than 500 lbs	0.0	491	0.0	432	0.2	473
Largest quantity of project seed planted (lbs)	20		180		1,240	
Median quantity of seed planted (lbs)	5		25		20	
Main sources of seed received (% of parcels):						
NGO	2.2	500	--		--	
SOSEP	15.6	500	--		--	
Municipality office	26.0	500	--		--	
MAGA	48.8	500	--		--	
ICTA	0.2	500	--		--	
Other	5.4	500	7.0	449	--	
don't know	1.8	500	2.0	449	--	
DICTA/SAG	--		40.5	449	--	
CIAL	--		18.9	449	--	
FIPAH	--		9.1	449	--	
PRR	--		6.2	449	--	
USAID	--		6.0	449	--	
FAO	--		6.0	449	--	
Zamorano	--		2.0	449	--	
Bolsa Samaritana	--		2.2	449	--	
Community Seed Bank	--		--		100.0	484

Source: BTD Project Beneficiary Survey 2012-13
Results are weighted to reflect the share of beneficiary population at the Region/Department level within the country

Table 16 presents the bean grain output realized on the parcels where the project seed was planted and how it was used. In Guatemala and Honduras, data were also collected on whether the farmers harvested any beans as green pods and how they were used. As indicated, 42% of farmers in Guatemala and 17% in Honduras reported harvesting beans as green pods. A majority of these farmers (83% in Honduras and 66% in Guatemala) harvested less than 25% of their beans in the green stage (Table 16). Most of these green pods were harvested for home consumption (76% in Guatemala and 93% in Honduras), which indicates that they may be meeting critical food needs for many households during the growing season.

A typical beneficiary farmer surveyed harvested on average 55, 458 and 491 lbs of bean grain from the parcel on which the project seed was planted in Guatemala, Honduras and Nicaragua, respectively (Table 16). This translates into 756, 1299 and 796 lbs/manzana bean grain yield realized from the parcels on which project seeds were planted in Guatemala, Honduras and Nicaragua, respectively. The seed to grain ratio realized among the surveyed beneficiaries was 1:14 lbs in Guatemala, 1:18 lbs in Honduras and 1:11 lbs in Nicaragua. FAOSTAT data for 2000-2012 (FAOSTAT, 2014) demonstrate that the average yield in Guatemala, Honduras and Nicaragua for this period is 1,104, 1,108, and 1,178 lbs/manzana, respectively. Compared to the FAOSTAT average, the average yield reported by beneficiary farmers is lower in Guatemala and Nicaragua and higher in Honduras. Further, while key informants in Guatemala and Honduras indicated that the quality of the seed that was distributed was good (good germination rate, and uniformity in color of flowers and maturity), the data suggest that the quality of the seed was slightly lower in Nicaragua (in terms of germination rate and purity), which may help to explain these differences in yields (Reyes, DeYoung and Maredia 2014).

As reported in Table 16, how the harvested grain was used varied across countries and reflects the difference in size/scale of bean production across countries. More than 70% of grains harvested per HH from the parcels on which the project seed was planted was kept as food in Guatemala, 11% was kept as seed and 14% was sold. In the case of Honduras, 54% was kept as food, 10% as seed and 22% was sold. In Nicaragua, 40% of total grain harvested from parcels on which project seed was planted was kept as food, 16% as seed and 17% was sold. This confirms that farmers in Guatemala mostly produced beans for own-consumption while farmers in Honduras and Nicaragua also produced beans with the intention to sell the grain. A very high percentage (25%) of grain harvested was reported as used for other purpose in Nicaragua (Table 16). A majority of this harvested grain was reported as ‘payment in kind’ to the local community seed bank. The estimate of 25% of grain on average used for payment-in-kind seems a bit high, though plausible.

The average price received for the largest quantity of beans sold by the project beneficiaries is about 70 US cents/lbs in Guatemala, which is more than double the price received by beneficiary farmers in Honduras (34 cents/lbs) and in Nicaragua (0.33 cents/lbs). The high price of beans reported in Guatemala may be indicative of the thin market for beans in the Departments where this survey was conducted. If the project beneficiaries are a close representation of the bean farmers in this region, this is not surprising as the average area devoted to beans was less than $1/10^{th}$ of a manzana and there is very little marketable surplus of beans produced by the farmers surveyed.

Table 16. Total beans harvested as greed pods and as grain on parcels where project seeds were planted and how the harvest was used

	Guatemala		Honduras		Nicaragua	
	Mean	N	Mean	N	Mean	N
Percentage of parcels on which beans were harvested as green pods	42.6	498	17.0	447	Dnc	
Among those that harvested as green pods, percentage of beans harvested in that stage:						
less than 25%	66.0	212	82.9	76	Dnc	
33%	9.0	212	3.9	76	Dnc	
50%	5.7	212	1.3	76	Dnc	
67%	1.9	212	0.0	76	Dnc	
75%	6.1	212	0.0	76	Dnc	
more than 75%	3.3	212	0.0	76	Dnc	
don't know	8.0	212	11.8	76	Dnc	
Percentage of farmers reporting the following use of green pods harvested						
sold all	16.0	212	2.6	76	Dnc	
consumed all	76.0	212	93.4	76	dnc	
part sold, part consumed	8.0	212	3.9	76	dnc	
Total quantity of bean grain harvested (lbs/parcel)	55.0	427	457.7	371	493.5	484
Total quantity of beans harvested per unit of area planted (lbs/manzana)	756.0	404	1,299.0	358	796.6	476
Total quantity of beans harvested per unit of seed planted (lbs of grain/lbs	13.6	431	17.9	371	10.7	484
Percentage of total grain harvested:						
lost due to pest or other problem	2.9	431	1.8	400	3.6	423
kept as food	72.1	431	53.6	400	38.7	423
kept as seed	10.5	431	9.7	400	16.0	423
Sold	14.0	431	21.5	400	16.7	423
Used for other purpose	0.6	431	6.6	400	25.0\b	423
Average price received for the largest quantity sale of beans sold (local	5.3	97	6.6	170	7.3	116
Average price received for the largest quantity of beans sold (US$/lbs) \a	0.69		0.34		0.33	

Source: BTD Project Beneficiary Survey 2012-13

Results are weighted to reflect the share of beneficiary population at the Region/Department level within the country
dnc=data not collected

\a Local currencies were converted into US$ using the following rates (prevalent at the end of 2011 and 2012 based on oanda.com website): 1 US$ = 7.7 Quetzales for Guatemala, 1 US$=19.3 Lempiras for Honduras and 1 US$ = 22.29 Cordobas for Nicaragua

\b Most of these responses on 'other purpose' relate to in-kind payment made to the local community seed bank

4.3. Perceptions and opinion on the quality and quantity of bean seeds received from the project and potential demand for seed

One of the goals of the BTD project was to lay the foundation for a sustainable bean seed system. Major factors that determine the sustainability of a seed system are the ability of the system to supply quality seed in quantities needed by farmers at affordable price. Thus, quality, quantity and price play a crucial role in determining whether the seed system that was developed / used under the BTD project can be sustainable beyond the project phase. In this section we present beneficiary perspective on these three aspects to help assess the potential demand for seed and farmers' willingness to pay for seed, so as to assess whether and what mechanisms can best address meeting these needs in a sustainable manner.

4.3.1. Perception on the quality of seed received from the BTD project

Since bean 'seed' is highly competitive with bean 'grain,' there has to be product differentiation in terms of how bean seeds are marketed or delivered to farmers and whether farmers are able to perceive that product as a quality planting material and not a multi-purpose product akin to the grains s/he harvests or purchases in the market. Thus, a critical aspect of 'quality seed' is its packaging and the form in which it is made available to potential customers (i.e., bean farmers). Sealed package with a label that describes the product is the gold standard of how seeds should be delivered to farmers if the aim is to differentiate the product and create a demand for seed. The survey results indicate that not all the beneficiaries received the bean seeds in a sealed package with a label. Honduras comes the closest in terms of meeting this standard as 83% of farmers reported receiving the project seed in a sealed package with a label and other 8 % received it in a bag that was either sealed but did not have a label (3%) or was not sealed but had the label (5%). In Guatemala, 54% of farmers reported receiving the seed in a sealed package with a label and another 22% reported receiving the seed in a bag that was open or did not have a label (Table 17). In Nicaragua, only 30% of farmers received the seed in a package that met both the quality standards of seed packaging—sealed and having a descriptive label with information. A majority of farmers in Nicaragua reported receiving bean seed in open bag without a label (33%) or other types of packaging such as 'a granel' (i.e., in bulk), sacks or 'en una pana' (i.e., in an open plastic container), which are likely not to be sealed or have a label.

Among those that reported receiving the bean seed in a bag that had a label, the information included on the label as reported by the respondents varied across type of information and country. Across all countries, variety name was reported as the most common information included on the label--66% of beneficiary farmers in Guatemala, 82% in Honduras and 96% in Nicaragua. A majority of respondents also indicated that the label included weight, date of production and germination rate (Table 17). Among all the types of information, date of production and germination rate was more frequently reported not to be included on the label or beneficiaries didn't know whether it was included. The ambiguity of the response 'don't know' indicates that either this information was not included on the label or it was included but not easily noticeable by the users or it could mean that the farmers did not pay close attention to the label and thus cannot tell whether the information was or wasn't on the label.

Table 17. Beneficiary perspective on the quality of seed received

	Guatemala		Honduras		Nicaragua	
	Mean	N	Mean	N	Mean	N
Type of package in which the seed was received (% of respondents)						
sealed package with a label	53.6	500	83.2	441	29.8	480
open bag with a label	21.0	500	4.8	441	6.9	480
sealed package w/out a label	1.2	500	3.2	441	3.1	480
open bag w/out a label	23.4	500	8.2	441	33.3	480
other or don't know	0.8	500	0.7	441	26.9\a	480
Among those that reported receiving seeds with a label, type of information included on the label (% of respondents)						
Variety name						
yes	65.7	473	81.6	413	96.6	176
no	0.8	473	6.1	413	0.6	176
don't know	33.5	473	12.3	413	2.8	176
Germination rate						
yes	51.5	473	60.5	413	74.4	176
no	1.8	473	7.7	413	17.6	176
don't know	46.7	473	31.7	413	8.0	176
Weight						
yes	55.8	473	82.8	413	93.2	176
no	1.1	473	6.5	413	4.0	176
don't know	43.2	473	10.7	413	2.8	176
Date of production						
yes	51.1	473	63.7	413	75.0	176
no	1.3	473	6.8	413	14.2	176
don't know	43.2	473	29.3	413	10.8	176
Farmers' rating on the quality of seed received compared with other seed planted in that season (% of respondents)						
lower quality	22.4	492	13.1	436	10.2	480
similar quality	27.9	492	28.7	436	24.2	480
higher quality	46.1	492	55.7	436	65.4	480
don't know	3.7	492	2.5	436	0.2	480
Among those that rated the quality low, the top three reasons provided by respondents for low seed quality						
top reason	Prone to disease and insect (39%)	110	Low/zero germination rate (30%)	57	Low/zero germination rate (40%)	48
second reason	Poor plant growth (27%)	110	Prone to disease and insect (26%)	57	Prone to disease and insect (15%)	48
third reason	Low/zero germination rate (19%)	110	Poor plant growth (25%)	57	Poor plant growth (15%)	48

Source: BTD Project Beneficiary Survey 2012-13

Results are weighted to reflect the share of beneficiary population at the Region/Department level within the country

\a In Nicaragua other types of packaging reported includes *'a granel'*, sack and *'en una pana'*

When asked about the overall quality of seed received from the BTD project, a high percentage of farmers rated the seed quality higher than or similar to other seed planted in that season. This is a favorable evaluation given by the beneficiaries on the quality of project distributed seeds. However, there are still a significant number of beneficiaries that rated the quality as lower than the quality of other seed they had planted, which indicates that there is still scope for improvement. The top three reasons provided on low seed quality rating were: low/zero germination rate, prone to disease / insect, and poor plant growth rate (Table 17). Since the quality was generally rated high, it appears that for a minority of farmers (as reflected in the N and the %) that reported facing the problem of zero or low germination rate could be due to factors other than the quality of seed (e.g., no adequate rainfall after planting to allow the seed to germinate).

Other characteristics of a seed system that end users value and that may influence their demand for seed are the accessibility of seed and the timeliness of its availability. Beneficiary perspective on these two aspects ranges widely across the countries as shown by the results of the survey in Table 18. Almost 80% of farmers in Honduras, 62% in Nicaragua and 56% in Guatemala reported that the project seed was delivered to them in the community where they reside. However, the other 20%, 38% and 44% of farmers in Honduras, Nicaragua and Guatemala, respectively, reported having to travel on average about 6-14 km to get the seed.

Table 18. Farmers' opinion on service provided by the seed distribution system used by the BTD project and prospects of future purchase of seed from the same source

	Guatemala		Honduras		Nicaragua	
	Mean	N	Mean	N	Mean	N
How was the seed delivered to the farmer (% of respondents)						
It was delivered in the community where the farmer resided	55.8	500	79.1	441	61.7	480
The farmer had to travel outside the community to get the seed	44.2	500	20.9	441	38.3	480
Among those that had to travel outside to access seed, average distance traveled (km)	5.9	218	14.1	92	8.5	180
When did the farmer receive the seed in relation to the planting timeframe (% of respondents)						
3-6 months before	0.0	500	4.8	441	0.2	480
One month before	22.0	500	32.4	441	28.3	480
One week before	29.6	500	42.9	441	51.1	480
Less than one week	9.8	500	5.4	441	10.0	480
After the date s/he was planning to plant	37.6	500	13.6	441	10.4	480
No response	1.0	500	0.0	441	0.0	480
Farmers willingness to purchase/seek seed from the same source s/he obtained the project seed (% of respondents)						
yes	55.0	498	76.4	441	85.8	480
no	30.0	498	18.6	441	10.2	480
don't know	15.0	498	4.9	441	3.9	480

Source: BTD Project Beneficiary Survey 2012-13

Results are weighted to reflect the share of beneficiary population at the Region/Department level within the country

Ability to deliver the seed in advance of the planting date is an indicator of the reliability of the seed system to meet the needs of the community in a timely manner, and thus an important determinant of future demand. As indicated in Table 18, a large number of beneficiaries (50-70%) received the project seed way in advance of the planting season (at least one week before), which is a good indicator of reliability of the seed system promoted by the BTD project partners. However, a significant percentage of farmers in all three countries reported receiving the seed less than one week before or after s/he was planning to plant. For example, this issue of 'late' delivery of seed was cited by close to 50% of farmers in Guatemala, 20% of farmers in Nicaragua and 19% of farmers in Honduras (Table 18). Key informants also reported late seed deliveries as a weakness of the distribution models (Reyes, DeYoung and Maredia 2014).

Perhaps a combination of factors related to accessibility, perception of quality, and timely availability of seed contributed to a significant number of beneficiaries responding 'no' or 'don't know' when asked if they would be willing to purchase or seek bean seed from the same source they obtained the project seed (Table 18). In the case of Guatemala 30% of farmers were not willing to purchase/seek seed from the same source and other 15% were unsure (as reflected in their response 'don't know'). More analysis is needed to understand the determinants of farmers' willingness or unwillingness to seek the seed from the source where they obtained the BTD seed.

Farmers who planted the project seed were asked for their opinion on the advantages and disadvantages of accessing bean seed from a local source as promoted by the BTD project. Results of this question are summarized in Table 19. Proximity of the seed source to the community or its presence in the community, flexibility in payment method, and timely availability of seed were cited as the two main advantages. On the flip side, the 'inadequate capacity to meet the quantity and diversity of seed needs of the community,' and 'seed not available on time' were identified as the two main disadvantages of the different seed delivery systems promoted by the BTD project (Table 19). Interestingly, timely availability and unavailability of seed was identified as both a pro and a con in Guatemala, which may be indicative of the diverse seed delivery mechanisms used in that country and/or the effectiveness of the system used in different community settings.

4.3.2. Perception on the quantity and price of seed received from the BTD project

The sustainability of the seed system also depends on whether it can recover the cost of producing and delivering quality seed demanded by the farmers. Thus cost recovery would be an important principle in building a sustainable seed system. In the case of the BTD project, it seems like this principle was not a driving force in the design of the project to reach the target number of beneficiaries. This is evident from the payment agreement seed recipients had with the seed provider, as reported by the beneficiaries (Table 20). These payment arrangements were not only country specific, but varied within a country on the target region, the implementing partner and the model used to deliver the seed. More than 70% of farmers in Guatemala and close to 50% farmers in Honduras reported receiving the project seed free of cost (Table 20). As against this only 5% farmers in Nicaragua received seed free of cost. This contradicts the information provided by key informants, none of who reported that farmers received free seed (Reyes, DeYoung and Maredia 2014). If there was any payment agreement, the most common agreement was to return the same amount or double the amount of grain after harvest. In Nicaragua, this was the dominant method of payment the farmers reported.

Table 19. Farmers' opinion on the advantages and disadvantages of accessing seed from the seed distribution system used by the BTD project

	Guatemala		Honduras		Nicaragua	
	Advantage / disadvantage	N	Advantage / disadvantage	N	Advantage / disadvantage	N
Farmers' opinion on the two main advantages of having access to a local source of seed as promoted by the BTD project						
most important advantage (% of responses)	Its proximity/presence in the community (58%)	500	Its proximity/presence in the community (68%)	441	Flexibility in payment method (67%)	480
second most important (% of responses)	Timely availability of seed (43%)	500	Flexibility in payment method (12%)	441	Its proximity/presence in the community (66%)	480
Farmers' opinion on the two main disadvantages of having access to a local source of seed as promoted by the BTD project						
most important disadvantage (% of responses)	Inadequate capacity to meet the seed needs of the community in terms of quantity (51%)	500	Inadequate capacity to meet the seed needs of the community in terms of diversity of varieties demanded (19%)	441	Inadequate capacity to meet the seed needs of the community in terms of quantity (37%)	480
second most important (% of responses)	Seed not available on time (40%)	500	Inadequate capacity to meet the seed needs of the community in terms of quantity (17%)	441	Inadequate capacity to meet the seed needs of the community in terms of diversity of varieties demanded (28%)	480

Source: BTD Project Beneficiary Survey 2012-13
Results are weighted to reflect the share of beneficiary population at the Region/Department level within the country

Some other types of agreements reported by farmers include paying in cash and sharing some harvested grain with other farmers in lieu of payment for seed. For those that paid in cash, the average price paid for seed was 6.8 Lempiras/lbs ($0.35/lb) in Honduras and 11.5 Cordobas/lbs ($0.52/lb) in Nicaragua. However, the sample size of farmers that paid cash for seed is too small to derive robust results on this indicator.

For those that paid in kind for seed received from the project in the form of grain we also present in Table 20 farmers' opinion on whether the payment agreement was lower, higher or at par with his/her willingness to pay for seed. In general the results suggest that in both the payment agreements, a majority of farmers indicated that the price they paid was at par with his/her willingness to pay or lower than what s/he was willing to pay. This is encouraging and in general, lends support to the effectiveness of the in-kind payment agreements targeted to different groups of farmers.

Table 20. Farmers' opinion on the payment arrangements for seed received

	Guatemala		Honduras		Nicaragua	
	Mean	N	Mean	N	Mean	N
Payment agreement on the seed received from the BTD project seed provider (% of farmers who...)						
Received the seed free of cost	71.4	482	47.9	441	5.0	480
Paid cash	0.6	482	3.9	441	8.1	480
Returned same amount of grain after harvest	26.1	482	19.7	441	40.0	480
Returned twice the grain after harvest	1.5	482	25.8	441	42.5	480
Did not pay anything to the seed provider, but had to share some harvested grain with other farmers	0.4	482	1.4	441	4.0	480
Had other arrangement	0.0	482	1.4	441	0.4	480
For those that paid cash, average amount paid (local currency/lbs)	--\a		6.8	17	11.5	39
Farmers' opinion on whether the payment agreement was…(% of respondents that paid 1 lbs grain for 1 lbs seed)						
Lower than his/her willingness to pay	16.0	100	11.8	85	6.8	192
At par with his/her willingness to pay	80.0	100	84.7	85	89.6	192
Higher than his/her willingness to pay	4.0	100	3.5	85	3.7	192
Farmers' opinion on whether the payment agreement was…(% of respondents that paid 2 lbs grain for 1 lbs seed)						
Lower than his/her willingness to pay	0.0	3	1.8	112	2.0	204
At par with his/her willingness to pay	33.0	3	95.5	112	91.7	204
Higher than his/her willingness to pay	67.0	3	2.7	112	6.4	204

Source: BTD Project Beneficiary Survey 2012-13
Results are weighted to reflect the share of beneficiary population at the Region/Department level within the country
\a too few observations to report the mean

The goal of the BTD project was to distribute small quantities of seed to a large number of farmers. Thus, by design the quantity of seed given to each farmer was limited; although as discussed before, the actual quantity of project seed farmers reported planting varied across countries as well as within a country (see Table 15). On average the beneficiary farmer in Guatemala reported receiving 6 lbs of bean seed, in Honduras 27 lbs and in Nicaragua 42 lbs. a majority of farmers indicated that the quantity of seed they received from the project was adequate to meet their needs. But a significant percentage of farmers in all three countries, especially in Nicaragua (44%) expressed the need for more seed (Table 21). Among those that indicated wanting more seed, the additional quantity needed was 9 lbs in Guatemala, 45 lbs in Honduras and 68 lbs in Nicaragua, and farmers in respective countries were willing to pay on average US$ 0.93, 0.64 and 0.41 per pound of additional seed. This represents an average willingness to pay 36%, 85% and 27% price premium above the average grain price received by farmers respectively in Guatemala, Honduras and Nicaragua (Table 21). However, this reported willingness to pay is by farmers that expressed the need for more seed, which may imply that they have larger land holdings and thus better endowed than the farmers who did not express the need for more seed. Thus the average price premium reflected in the willingness to pay for seed may be an upper bound rather than a mean or a median value for the entire beneficiary population.

Table 21. Beneficiary perspective on the quantity of seed received and willingness to pay for additional quantity, if needed more

	Guatemala		Honduras		Nicaragua	
	Mean	N	Mean	N	Mean	N
Average quantity of seed received from the BTD project (lbs)	6.5	499	26.7	441	42.1	480
Was the quantity of seed received adequate for the farmers' needs? (percentage of respondents)						
yes	77.0	495	86.0	441	56.2	480
no, wanted more	23.0	495	14.0	441	43.8	480
Those that indicated wanting more seed, quantity of seed of that variety needed that season and farmers' willingness to pay						
Additional quantity needed (lbs)	9.1	106	44.5	62	67.7	213
Willingness to pay for seed (local currency/lbs)	7.2	103	12.3	57	9.3	213
Median willingness to pay (local currency/lbs)	5.0		10.0		10.0	
Willingness to pay for seed (US$/lbs)	0.93		0.64		0.41	
Seed price premium willing to pay (% more than grain price)	36.3%		85.2%		26.9%	
Average grain price received by farmers (local currency/lbs)	5.3		6.6		7.3	
% of farmers willing to pay for seed more than the average price of grain:	40.8	103	78.9	57	74.6	213
% of farmers willing to pay for seed more than twice the average price of grain:	6.8	103	33.3	57	7.0	213

Source: BTD Project Beneficiary Survey 2012-13
Results are weighted to reflect the share of beneficiary population at the Region/Department level within the country

Even with this group of farmers that needed more bean seed to satisfy their need, the percentage of farmers willing to pay for seed more than double the average price of grain (which is equivalent to returning two lbs of grain for 1 lbs of seed) was only 7% in Guatemala and Nicaragua, and 33% in Honduras. In the case of Guatemala the percentage of farmers willing to pay for seed at least the grain price was only 41%. More farmers in Honduras (79%) and Nicaragua (75%) were willing to pay at least the grain price; but there was still a significant proportion of farmers from this sub-set that were not even willing to pay a price that is equivalent to the grain price. The larger the share of this type of farmers the more challenging it becomes to come up with a sustainable seed system based on the principle of 100% cost-recovery.

4.3.3. Assessing the potential demand for certified seed and farmer's willingness to pay for quality seeds of varieties with all desired traits

In most countries, the established government policy is to promote the use of 'certified' seeds, that are produced, stored and packaged under the recommended technical standards, undergo inspection and testing from a government authorized entity, and sold as certified or registered seed only if it meets the set standards of quality planting material in terms of purity, uniformity,

germination rate, etc. The goal of this system is to ensure that farmers are provided clean and quality seed which is the starting point to a successful crop. However, certified seeds are high priced and not easily available to farmers. This creates a discrepancy in the goals set by the government that a large numbers of farmers should be using certified seeds and the actual use of this type of seed in the country.

To gauge the potential demand for certified bean seed, farmers surveyed for this study were asked about their knowledge, use and potential quantity and frequency of certified seed they would purchase if it were available and affordable. The results indicate that farmers' knowledge and awareness about certified seeds is very high in Honduras (100%) and Nicaragua (98%), but lags in Guatemala (79%) (Table 22). However, easy access to certified bean seed was reported as an issue in all three countries, but at varying rate. In Guatemala only 19% of surveyed farmers indicated having easy access to certified bean seed. In Nicaragua a third of the farmers have easy access and in Honduras 44% of farmers reported having easy access to certified bean seed (Table 22).

Not surprisingly, the actual use of certified bean seed by surveyed farmers is highly correlated with 'accessibility.' More than 50% of farmers surveyed in Guatemala and Nicaragua report that they have never used certified bean seeds. A high percentage of respondents in Honduras (52%) and Guatemala (31%) have used certified bean seed in the past that was given to them free of cost. Only 13%, 27% and 30% of farmers in Guatemala, Honduras and Nicaragua, respectively, report using purchased certified bean seed in the past (Table 22).

When asked about the opinion on how frequently they would purchase certified bean seed if it was easily available and affordable, 42% of farmers in Honduras expressed interest in purchasing the seed every planting season and another 34% said they would buy it once a year (Table 22). Similarly, more than 50% of farmers in Guatemala expressed the willingness to buy certified bean seed either every planting season (33%) or once a year (18%). The willingness to purchase certified bean seed every planting season or once a year was least among farmers surveyed in Nicaragua. Surprisingly, close to 48% farmers in Nicaragua, 40% farmers in Guatemala and 22% of farmers in Honduras expressed no desire to purchase certified seed even if it was easily available and affordable (Table 22). This shows that for a self-pollinated crop like beans where home saved seed is the most common practice, it is very difficult to convince farmers to purchase seed even if it was made easily available and affordable.

The quantity of certified seed a farmer would be willing to purchase at a given frequency when averaged across all the sampled farmers (i.e., including those that would not purchase certified seed) comes to about 4.2 lbs in Guatemala, 33 lbs in Honduras and 36 lbs in Nicaragua. Not surprisingly, this is correlated with farmers' reported total land holdings (highest in Nicaragua and lowest in Guatemala). Among those who are willing to purchase certified seed, the average demand expressed (across all frequencies) was 7 lbs in Guatemala, 42 lbs in Honduras and 71 lbs in Nicaragua (Table 22). The average quantity of seed farmers expressed interest in buying every season or once a year was close to this average across all frequencies in all three countries.

Table 22. Farmers' access to certified seeds and potential demand as expressed by the quantity and frequency of purchase of certified seed

	Guatemala		Honduras		Nicaragua	
	Mean	N	Mean	N	Mean	N
Farmers' knowledge and awareness about certified seeds (% of respondents who...)						
Know what is certified seed	78.6	499	100	441	97.5	480
Don't know what is certified seed	21.4	499	0	441	2.5	480
Percentage of farmers that have easy access to certified seeds of bean	18.8	499	43.9	441	32.3	480
Percentage of farmers who have used certified bean seed and mode of acquisition						
Have used it, it was given free of cost	30.7	499	52.4	441	15.0	480
Have used it , it was purchased	12.8	499	26.5	441	30.4	480
Have not used it	56.5	499	21.1	441	54.6	480
If easily available and affordable, how frequently farmers would purchase certified bean seed (% of respondents)						
Every planting season	32.6	500	42.0	436	23.5	480
Once a year	18.2	500	33.5	436	22.1	480
Once every two years	5.8	500	1.8	436	2.9	480
Once every three years	3.2	500	0.5	436	1.9	480
Less frequently than 3 years	0.1	500	0.5	436	2.1	480
Would not purchase certified seed	39.6	500	21.8	436	47.5	480
Average quantity of certified seed a farmer would be willing to buy at a given frequency (average across all frequencies) (lbs)	4.2	495	32.6	436	35.7	480
Average quantity of certified seed a farmer would be willing to buy at a given frequency (excluding zero frequency) (lbs)	7.3	287	41.6	342	70.8	252

Source: BTD Project Beneficiary Survey 2012-13
Results are weighted to reflect the share of beneficiary population at the Region/Department level within the country

Note that the willingness to purchase certified seed as indicated in Tables 22 and 23 are simply stated preference and not backed by actual revealed purchasing behavior. Thus the results should be viewed as indicative level of demand rather than a solid evidence of actual demand for certified or quality bean seed.

Seed as an input in agricultural production system is a tangible product that embodies two intangible components--the 'variety' or the genetic component, and the 'seed quality' component. When evaluating the demand for seed, it is important to understand whether the demand (or lack of demand) is due to the varietal component, the quality component or both. The results presented in Table 22 focused more on the quality component of bean seed. It addressed the question--what would be the willingness of farmers to purchase (the quantity and frequency of) bean seed that met the quality standards as endorsed by the certification process? In Table 23, we present results of farmers' demand for different varietal traits and their (hypothetical) willingness to pay for quality seeds that had all the desired varietal traits. In other words, we

bring in the varietal component in the assessment of demand for seed. This module was only included in the latter two surveys conducted in Honduras and Guatemala. Thus the results are only presented for these two countries.

Table 23. Varietal trait preferences and potential demand for seeds of improved varieties

	Guatemala		Honduras		Nicaragua	
	Mean	N	Mean	N	Mean	N
Average ranking assigned to following traits on a scale of 1-10, with 1=highly preferred						
Seed color and size	4.5	450	4.0	437	dnc	
Resistance to field pests and diseases	5.6	452	4.0	437	dnc	
Resistance to storage pests	6.1	450	4.6	437	dnc	
Cooking time	4.1	487	5.6	437	dnc	
Yield	3.4	483	2.9	437	dnc	
Taste	2.7	486	5.4	437	dnc	
Earliness of maturity	4.4	474	5.1	437	dnc	
Marketability (Easy to sell)	6.9	450	6.4	437	dnc	
Taste of green pods	6.1	448	7.2	437	dnc	
Maximum amount of money a farmer is willing to pay per pound for the seed of a variety that had the preferred qualities (local currency/lbs)	5.6	497	12.5	441	dnc	
(US$/lbs)	$0.73		$0.65			
Frequency at which a farmer is willing to purchase clean and high quality seed of a variety with desired traits (% of respondents)						
1 year	70.8	497	91.1	440	dnc	
2 years	14.1	497	1.4	440	dnc	
3 years	5.2	497	0.2	440	dnc	
4 years	0.4	497	0.2	440	dnc	
5 years	0.6	497	0.0	440	dnc	
More than 5 years	0.0	497	0.0	440	dnc	
Would not purchase seed (would only use saved seed)	8.9	497	7.1	440	dnc	
Those that are willing to purchase seed, the quantity of seed a farmer is willing to purchase at a given frequency (lbs):						
Every year	8.2	351	32.3	401	dnc	
Every two years	7.4	70	40.0	6	dnc	
More than three years	10.8	31	36.0	2	dnc	

Source: BTD Project Beneficiary Survey 2012-13
Results are weighted to reflect the share of beneficiary population at the Region/Department level within the country
dnc=data not collected

In terms of highly preferred varietal traits, high yield was ranked number 1 in Honduras and number 2 in Guatemala by a majority of farmers (Table 23). Resistance to field pests and diseases, seed color and resistance to storage pest came next in the list of highly preferred

varietal traits in beans in Honduras. In Guatemala, taste was ranked number one preferred trait followed by yield, cooking quality, early maturity and seed color and size. Marketability and taste of green pods ranked lower in the list across both the countries. The maximum amount of money a farmer was willing to pay for a seed of a variety that had the preferred qualities was US$ 0.73/lbs in Guatemala and $0.65/lbs in Honduras (Table 23). In relation to the price of bean grain, this average willingness to pay is above the price of grain per pound, but does not reflect a high price premium that can justify seed production and distribution by a private sector.

More than 70% of farmers in Guatemala and more than 90% in Honduras expressed willingness to purchase seeds of preferred varieties every year. The average quantity of seed a typical farmer would be willing to purchase every year was 32 lbs, every two years 40 lbs and every three years or more was 36 lbs in Honduras. In comparison, farmers in Guatemala expressed the willingness to purchase 8-10 lbs of quality seeds that had all the desired traits if it was available at the price they were willing to pay (Table 23). Given that farmers in Guatemala reported fewer land holdings, it is not surprising that they would demand smaller amounts of quality seed with all their desired traits.

5. Discussion and Concluding Remarks

This final section summarizes key results and identifies lessons and implications on seed system development for broader applicability. The results of the beneficiary survey indicate that beans play an important but varying role in HH economy across the three countries. The share of beans in total area cultivated, in household income and in household consumption satisfied from own production ranges from 13-22%, 16-35%, and 40-63%, respectively across the three countries. The surveyed beneficiaries from Guatemala fall on the lower end of this range on all three indicators. There are vast differences in HH characteristics such as access to land, ownership of assets, and access to infrastructure and amenities across these countries. For example, bean area cultivated per household in Nicaragua is 3.4 times larger than in Honduras, which in turn is 4 times larger than in Guatemala. As a result, beneficiaries in Nicaragua and Honduras report producing, selling and consuming more beans (i.e., report to be more 'bean secured') than the beneficiaries surveyed in Guatemala. For example, 16% of farmers surveyed in Guatemala report that their beans last less than one month after harvest and for another 24% the bean harvest lasts less than 3 months. In Honduras and Nicaragua, the percentage of beneficiaries reporting their bean reserves lasting less than 3 months is 12%. Thus 'bean security' is highly correlated with the land area cultivated to beans (and thus with the production capacity).

In general, the socio-economic profile of beneficiary HHs in Guatemala appear to be more concentrated on the disadvantaged and more challenging spectrum of the distribution relative to the average HH beneficiary in Nicaragua, with Honduran farmers falling in the middle of this spectrum. To reiterate, these differences in the beneficiary profiles partly stem from the fact that in Guatemala and Honduras the focus of this survey was on the Feed the Future priority Departments where farmers are likely to be poor and practicing agriculture in more marginal conditions than other parts of the countries where the BTD project was operational. The results of the survey presented in this report are likely to represent the lower-bounds of project benefits in Guatemala and Honduras, and not representative of the typical beneficiary of the BTD project

over the three years and across the country. On the other hand, in Nicaragua all Departments were included in the survey, and the results are closer to being representative of the project population that was targeted.

Despite the differences in beneficiary profiles, the results in terms of beneficiary satisfaction are quite similar across the three countries. Overall, beneficiaries in all three countries reported a high level of satisfaction with the seed quality and gave a very positive evaluation of the project. This is reflected in the high percentage of farmers who plan to grow the bean varieties received from the project in the next season. A high proportion of farmers also indicated that they plan to increase or not change the area planted to that variety in future, and were willing to purchase or seek seed from the same source he/she received the project seed.

The results of the survey presented in this report point to several shortcomings in the way the BTD project was implemented and are identified as areas of improvement for future efforts. These relate mostly to the issue of when and how the seed was delivered to the beneficiaries. The ability of the seed system to deliver the seed on time is one of the characteristics of an efficient seed system and a majority of farmers who benefited from the BTD project did receive the seed in advance of the planting season. However, about 20-47% of farmers in the three countries reported receiving the seed less than one week before or after the planting date. This result points to the logistical challenges of designing seed dissemination efforts targeted to reach thousands of farmers across the country and the need for more attention on coordinating the time and place where the seed is produced with the time and place where seed is needed.

Another aspect that needs more attention is the way seed is delivered to the farmers. A high percentage of farmers in Nicaragua and Guatemala received seeds in less than ideal packaging (i.e., open bags) and with inadequate information on what they were receiving, such as the name of the variety. Since bean 'seed' competes with bean 'grain' as planting material in smallholder farm economy, it is important that the seed dissemination efforts devote adequate attention to the packaging and labeling aspects to differentiate the product they are distributing and to create a demand for seed.

The experience of the BTD project offers an opportunity to derive lessons for extension of such efforts in future or in other countries. First, in none of the countries, the seed was 100% sold to farmers for a cash price. To be fair, the BTD project was implemented in the mode of a 'development project' and partners were not expected to develop a seed production and distribution system based on the principle of cost recovery. The price of the seed and method of payment thus varied from zero price (i.e., distributing the seed free of cost) to 'in-kind' payment in the form of returning one or two pounds of grain for each pound of seed received. Among those that paid for seed in-kind, results indicate that the seed to grain ratio charged as a price was considered by most beneficiaries to be at par with their willingness to pay for seed. Among those that needed additional quantities of seed, there was a willingness to pay for seed, but this varied across countries and was highly correlated with the economic status of bean farmers. Farmers in Honduras and Nicaragua were more willing to pay for seed with a premium over the grain price than farmers in Guatemala. These results thus indicate that in some communities meeting the seed needs based on 100% cost-recovery principle may not be possible. Thus, any scaling up

efforts that target small holder farmers must be based on a two-pronged approach of subsidies and cost recovery.

Second, if the principle of cost-recovery is imposed, there is potentially a greater probability of recovering the total or partial cost of seed production in models where farmers get the final seeds from a 'local' entity such as a CIAL or a community seed bank. This is because farmers know each other in the community and are more inclined to pay the seed back to keep his/her good reputation, and farmers see the value of repaying the seed to be able to access more seed in the future. In fact, from the perspective of the beneficiaries, flexibility in payment method and proximity/presence of seed production/distribution closer to the community were identified as the strength of the models used by the BTD project. Future seed system development efforts should integrate these features (i.e., flexibility in payment method and proximity of seed production closer to the community) to increase the likelihood of recovering at least part of the cost of disseminating quality seeds.

Lastly, despite favorable quality rating, the average yield and seed to grain ratio reported by farmers were not very impressive. This indicates that although good seed is a necessary condition for good agriculture, it is not a sufficient condition. To realize the full potential of the quality seeds in farmers' fields requires access to other complementary inputs and information/knowledge on agronomic and farm practices that were not provided as part of the BTD project. Thus any extension of such project in future should be based on integrating seed distribution efforts with technical support (or vice versa). It seems like taking an integrated approach to enhancing bean productivity may be a better strategy to realize the full potential of the quality seeds in farmers' fields.

References cited

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Reyes, B., D. DeYoung, and M. Maredia. 2014. An Assessment of the Bean Seed Dissemination Models in Central America as Implemented Under the Bean Technology Dissemination (BTD) Project. Staff Paper No. 2014-03 Department of Agricultural, Food and Resource Economics, Michigan State University.

Annex A:

Summary Tables by Departments/Regions

Table A3. Demographic profile of project beneficiaries, by Departments/Regions

	Guatemala					Honduras							Nicaragua				
	Hue-hueten	Quetzalte	Quiche	San Marco	Toto-nicap	Atlantida	Copan	Inti-buca	Lem-pira	Ocote-peque	Santa Barbara	Yoro	Centro Norte	Centro Sur	Las Segovias	Pacifico Norte	Pacifico Sur
N =	**275**	**51**	**60**	**70**	**44**	**36**	**50**	**20**	**85**	**50**	**95**	**105**	**99**	**178**	**44**	**79**	**80**
Average age (years)	42.5	41.6	39.4	42.1	38.6	47.4	47.3	36.0		44.0	42.2	43.0	41.4	43.2	44.8	42.3	42.6
Gender of respondent (% of respondents)																	
Male	62.9%	0.0%	60.0%	4.3%	6.8%	91.7%	86.0%	75.0%	81.2%	76.0%	70.5%	91.4%	71.7%	75.8%	65.9%	84.8%	58.8%
Female	37.1%	100.0%	40.0%	95.7%	93.2%	8.3%	14.0%	25.0%	18.8%	24.0%	29.5%	8.6%	28.3%	24.2%	34.1%	15.2%	41.3%
Relationship with the head of the HH (% of beneficiaries)																	
Self	65.8%	5.9%	61.7%	14.3%	13.6%	91.7%	74.0%	75.0%	82.4%	86.0%	78.9%	91.4%	76.8%	86.5%	68.2%	70.9%	62.5%
Spouse	29.8%	92.2%	38.3%	81.4%	84.1%	5.6%	18.0%	15.0%	12.9%	10.0%	18.9%	3.8%	14.1%	12.9%	22.7%	12.7%	21.3%
Son/daughter	4.4%	2.0%	0.0%	1.4%	2.3%	2.8%	4.0%	10.0%	3.5%	4.0%	2.1%	4.8%	8.1%	0.6%	9.1%	12.7%	13.8%
Other	0.0%	0.0%	0.0%	2.9%	0.0%	0.0%	4.0%	0.0%	1.2%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	3.8%	2.5%
Average number of years of education	3.1	2.2	1.7	2.3	2.8	3.6	2.2	4.2	4.7	6.0	4.9	3.6	4.7	3.8	4.8	5.0	6.2
Percentage of beneficiaries who cannot read/write	26.5%	43.1%	51.7%	27.1%	36.4%	16.7%	28.0%	0.0%	4.7%	2.0%	2.1%	10.5%	14.1%	11.8%	9.1%	15.2%	6.3%
Number of years of farming experience	24.6	17.4	12.3	25.6	21.3	25.4	27.8	16.8	19.6	27.9	22.3	21.4	17.9	19.2	19.2	21.0	20.8
Number of years of experience of growing beans	19.8	9.3	9.5	20.5	11.4	22.8	27.0	8.0	14.3	24.5	18.0	19.0	17.1	16.1	17.8	19.2	20.4
Membership in a local community seed bank (% of beneficiaries)	0	0	0	0	0.02%	5.6%	8.0%	30.0%	12.9%	0.0%	15.8%	34.3%	52.5%	12.9%	56.8%	5.1%	13.8%
Membership in a farmer organization/association (% of beneficiaries)	9.8%	54.9%	13.3%	75.7%	72.7%	61.1%	44.0%	45.0%	52.9%	40.0%	22.1%	36.2%	51.5%	27.5%	43.2%	24.1%	23.8%

Source: BTD Project Beneficiary Survey 2012-13

Table A4. Characteristics of households that received bean seed from the BTD project, by Departments/Regions

	Guatemala					Honduras							Nicaragua				
	Hue-hueten	Quet-zalte	Quiche	San Marco	Toto-nicap	Atlantida	Copan	Inti-buca	Lem-pira	Ocote-peque	Santa Barbara	Yoro	Centro Norte	Centro Sur	Las Segovias	Pacifico Norte	Pacifico Sur
N =	**275**	**51**	**60**	**70**	**44**	**36**	**50**	**20**	**85**	**50**	**95**	**105**	**99**	**178**	**44**	**79**	**80**
Average size of the HH	6.4	6.9	5.9	7.5	6.6	5.1	6.0	5.6	5.7	4.7	4.9	5.3	5.2	5.38	5.11	5.09	4.94
Percentage HH members – female	52.0%	53.0%	49.5%	50.8%	52.3%	44.1%	46.7%	58.0%	52.6%	50.2%	47.1%	50.2%	51.2%	47.2%	53.2%	47.7%	48.1%
Percentage HH members less than 5 years old	13.1%	10.6%	13.6%	10.8%	12.0%	14.7%	12.3%	18.8%	13.2%	7.7%	13.5%	11.7%	dnc	dnc	dnc	dnc	dnc
Number of parcels of agricultural land under HH management																	
Owned	1.6	1.7	0.9	0.1	1.4	0.4	0.9	1.0	1.0	1.0	1.0	0.6	1.1	0.8	0.9	0.9	0.8
Rented/borrowed	0.2	0.4	0.2	0.1	0.1	0.2	0.4	0.1	0.1	0.3	0.2	0.3	0.5	0.3	0.6	0.3	0.7
Total	1.8	2.1	1.1	0.2	1.5	0.7	1.3	1.1	1.1	1.3	1.2	0.9	1.6	1.2	1.5	1.1	1.4
Average land holding (manzana) \a																	
Owned	0.62	0.25	0.57	0.51	0.30	0.4	1.2	1.0	1.5	4.8	4.0	0.5	3.8	16.0	3.8	8.9	4.5
Rented/borrowed	0.06	0.04	0.07	0.04	0.01	0.1	0.4	0.1	0.1	0.3	0.2	0.3	1.2	0.9	1.0	0.5	1.3
Total	0.68	0.29	0.64	0.55	0.31	0.5	1.6	1.1	1.7	5.1	4.2	0.8	4.9	16.9	4.8	9.4	5.9
Percentage of HHs that accessed agricultural credit in the past 12 months	5.8%	5.9%	1.7%	5.7%	2.3%	0.0%	18.0%	20.0%	14.1%	18.0%	1.1%	8.6%	43.4%	35.4%	36.4%	29.1%	28.8%
Tropical Livestock Units owned (average number of TLUs/HH)	0.66	1.17	3.31	1.41	0.70	2.8	1.1	1.0	1.8	2.1	1.7	1.4	3.1	10.4	2.4	3.1	2.5
Distance of the house from the nearest market (km)	5.3	4.3	8.3	9.3	8.1	7.4	18.6	42.5	16.1	9.0	12.2	10.3	17.1	21.1	15.4	16.4	9.2
Distance of the house from the nearest paved road (km)	7.3	0.8	6.8	8.8	3.9	10.9	20.1	35.4	17.9	5.5	7.8	29.7	13.7	7.3	11.8	7.9	6.2
Percentage of HH dwellings with access to:																	
well	13.8%	17.6%	23.3%	4.3%	18.2%	16.7%	4.0%	45.0%	36.5%	6.0%	23.2%	10.5%	26.3%	57.9%	43.2%	35.4%	31.3%
latrine	88.7%	72.5%	76.7%	94.3%	100%	94.4%	86.0%	85.0%	83.5%	100%	91.6%	76.2%	93.9%	82.0%	90.9%	88.6%	93.8%
bathroom	49.1%	68.6%	65.0%	20.0%	38.6%	66.7%	50.0%	55.0%	61.2%	96.0%	75.8%	32.4%	73.7%	55.6%	63.6%	72.2%	81.3%
running water	86.9%	94.1%	96.7%	92.9%	88.6%	91.7%	94.0%	55.0%	90.6%	100%	97.9%	90.5%	80.8%	33.7%	45.5%	62.0%	57.5%
electricity	82.2%	98.0%	81.7%	95.7%	97.7%	52.8%	86.0%	0.0%	35.3%	100%	88.4%	41.9%	64.6%	50.6%	59.1%	75.9%	85.0%
Membership by any HH member in a local community seed bank (% of households)	0	0	0	0	0.02	36.1%	54.0%	25.0%	41.2%	60.0%	64.2%	33.3%	71.7%	37.1%	70.5%	25.3%	37.5%
Likelihood that an average beneficiary HH is below the national poverty line (based on the country-specific poverty score)	70.3	52.2	90	83	70.3	68.7	68.7	68.7	68.7	38.2	57.0%	68.7	dnc	dnc	dnc	dnc	dnc

Source: BTD Project Beneficiary Survey 2012-13

dnc=data not collected to calculate this statistic

\a total land holding under HH management corresponds to Segunda/Postrera 2012 for Guatemala and Honduras and Primera 2012 for Nicaragua

Table A6. Sources and diversity of household income and percentage of HH income derived from bean grain sale (self-reported by respondents), by Departments/Regions

	Guatemala					Honduras							Nicaragaua				
	Hue-hueten	Quet-zalte	Quiche	San Marco	Toto-nicap	Atlantida	Copan	Inti-buca	Lem-pira	Ocote-peque	Santa Barbara	Yoro	Centro Norte	Centro Sur	Las Segovias	Pacifico Norte	Pacifico Sur
N =	**275**	**51**	**60**	**70**	**44**	**36**	**50**	**20**	**85**	**50**	**95**	**105**	**99**	**178**	**44**	**79**	**80**
Percentage of HHs reporting following sources of income in the past 12 months:																	
Field crop sales	28.0%	41.1%	83.3%	10.0%	11.4%	83.3%	72.0%	70.0%	77.6%	74.0%	76.8%	78.1%	84.8%	79.8%	75.0%	84.8%	71.3%
Horticulture crop sales	12.4%	31.4%	75.0%	10.0%	11.4%	2.8%	8.0%	15.0%	17.6%	14.0%	1.1%	1.9%	19.2%	10.7%	13.6%	0.0%	8.8%
Dairy product sales	0.7%	39.2%	53.3%	14.3%	0.0%	2.8%	4.0%	0.0%	8.2%	10.0%	9.5%	2.9%	19.2%	53.4%	20.5%	17.7%	17.5%
Livestock sales for meat	21.1%	39.2%	30.0%	0.0%	0.0%	5.6%	2.0%	0.0%	7.1%	8.0%	4.2%	4.8%	10.1%	35.4%	18.2%	13.9%	21.3%
Other agricultural activities	10.5%	7.8%	5.0%	4.3%	0.0%	8.3%	20.0%	25.0%	30.6%	16.0%	18.9%	13.3%	16.2%	8.4%	11.4%	3.8%	12.5%
Renting/leasing land or farm equipment	2.9%	2.0%	11.7%	0.0%	0.0%	0.0%	2.0%	0.0%	0.0%	2.0%	0.0%	1.0%	6.1%	11.2%	9.1%	2.5%	8.8%
Wages/salaries from agricultural labor	72.0%	51.0%	80.0%	75.7%	63.6%	41.7%	46.0%	15.0%	29.4%	22.0%	41.1%	53.3%	37.4%	47.2%	43.2%	34.2%	35.0%
Wages/salaries from non-agriculture sector	5.5%	19.6%	13.3%	12.9%	6.8%	5.6%	4.0%	15.0%	8.2%	14.0%	9.5%	19.0%	21.2%	10.7%	29.5%	30.4%	30.0%
Income from non-farm business	16.0%	25.5%	8.3%	15.7%	59.1%	11.1%	6.0%	5.0%	7.1%	16.0%	10.5%	7.6%	13.1%	9.0%	9.1%	13.9%	21.3%
Percentage of HHs receiving remittance income in the past 12 months						11.1%	12.0%	25.0%	0.0%	14.0%	0.0%	6.7%	10.1%	13.5%	20.5%	15.2%	16.3%
Diversity of income (average number of sources of HH income reported)	1.89	2.06	3.6	1.63	1.86	1.77	1.64	1.55	1.92	1.85	1.76	1.86	2.40	2.80	2.38	2.30	2.47
Percentage of HHs reporting the following percentage of HH income from bean grain sales:																	
Zero	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	5.1%	7.5%
Less than 25%	88.4%	94.1%	88.3%	95.7%	95.5%	30.6%	62.0%	75.0%	57.6%	62.0%	52.6%	44.8%	25.3%	48.9%	43.2%	29.1%	46.3%
25-50%	7.3%	3.9%	10.0%	4.3%	4.5%	36.1%	14.0%	20.0%	24.7%	26.0%	32.6%	28.6%	29.3%	30.9%	27.3%	41.8%	35.0%
50-75%	1.8%	2.0%	1.7%	0.0%	0.0%	22.2%	12.0%	5.0%	11.8%	4.0%	10.5%	12.4%	21.2%	10.1%	22.7%	21.5%	7.5%
More than 75%	1.8%	0.0%	0.0%	0.0%	0.0%	11.1%	12.0%	0.0%	5.9%	6.0%	0.0%	14.3%	24.2%	9.0%	6.8%	2.5%	3.8%
Don't know/no response	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	3.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Reported share of total income derived from bean grain sales, average across all HHs (%)	16.6%	14.5%	15.8%	13.6%	13.6%	40.9%	31.0%	20.0%	28.9%	25.7%	26.5%	36.5%	48.6%	31.8%	35.7%	34.9%	26.8%

Source: BTD Project Beneficiary Survey 2012-13

dnc=data not collected

Table A7. Importance of beans derived from own production in meeting the household food consumption needs, by Departments/Regions

	Guatemala					Honduras							Nicaragua				
	Hue-hueten	Quet-zalte	Quiche	San Marco	Toto-nicap	Atlantida	Copan	Inti-buca	Lem-pira	Ocote-peque	Santa Barbara	Yoro	Centro Norte	Centro Sur	Las Segovias	Pacifico Norte	Pacifico Sur
N =	**275**	**51**	**60**	**70**	**44**	**36**	**50**	**20**	**85**	**50**	**95**	**105**	**99**	**178**	**44**	**79**	**80**
Percentage of HHs reporting the following percentage of total bean consumption satisfied by own production:																	
Less than 25%	46.5%	54.9%	16.7%	42.9%	25.0%	8.3%	16.0%	15.0%	12.9%	8.0%	11.6%	5.7%	6.1%	16.9%	18.2%	10.1%	15.0%
25-50%	33.8%	27.5%	13.3%	20.0%	36.4%	50.0%	18.0%	25.0%	15.3%	12.0%	13.7%	25.7%	13.1%	20.8%	36.4%	16.5%	17.5%
50-75%	9.5%	5.9%	8.3%	17.1%	20.5%	19.4%	18.0%	25.0%	24.7%	14.0%	21.1%	30.5%	20.2%	24.2%	9.1%	15.2%	22.5%
More than 75%	9.1%	11.8%	61.7%	20.0%	18.2%	22.2%	48.0%	35.0%	47.1%	66.0%	52.6%	38.1%	60.6%	38.2%	36.4%	58.2%	45.0%
Don't know	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Reported share of total bean consumption satisfied from own production, average across all HHs (%)	32.7%	31.1%	66.2%	41.0%	45.5%	51.3%	62.0%	57.5%	63.9%	72.0%	66.4%	62.7%	71.0%	58.0%	53.4%	67.8%	61.8%
Percentage of HHs reporting the following duration their bean grain reserves typically last after harvest:																	
less than one month	16.0%	27.5%	0.0%	20.0%	13.6%	0.0%	6.0%	0.0%	3.5%	2.0%	1.1%	1.0%	0.0%	7.3%	2.3%	0.0%	2.5%
1-3 months	23.6%	37.3%	11.7%	21.4%	34.1%	22.2%	16.0%	10.0%	7.1%	6.0%	11.7%	7.6%	8.1%	10.7%	11.4%	1.3%	6.3%
3-6 months	32.7%	25.5%	13.3%	30.0%	29.5%	27.8%	36.0%	40.0%	21.2%	30.0%	19.1%	12.4%	13.1%	12.9%	15.9%	2.5%	8.8%
6-9 months	11.3%	2.0%	11.7%	8.6%	4.5%	30.6%	26.0%	20.0%	22.4%	32.0%	25.5%	48.6%	13.1%	7.9%	6.8%	13.9%	13.8%
until the harvest in the following season	13.5%	3.9%	58.3%	18.6%	18.2%	13.9%	10.0%	20.0%	42.4%	22.0%	41.5%	30.5%	65.7%	58.4%	59.1%	82.3%	67.5%
Don't know	2.9%	3.9%	5.0%	1.4%	0.0%	5.6%	6.0%	10.0%	3.5%	8.0%	1.1%	0.0%	0.0%	2.8%	4.5%	0.0%	1.3%
Percentage of HHs reporting the following frequency of bean purchase for consumption after the grain reserves from own production is over:																	
Never	12.7%	0.0%	60.0%	24.3%	11.4%	13.9%	28.0%	5.0%	35.3%	56.0%	38.3%	41.0%	68.7%	50.0%	50.0%	51.9%	47.5%
Every day	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	0.0%	3.5%	6.0%	2.1%	3.8%	0.0%	2.2%	6.8%	7.6%	2.5%
Few times per week	20.4%	39.2%	13.3%	15.7%	18.2%	8.3%	16.0%	10.0%	12.9%	2.0%	9.6%	9.5%	7.1%	5.6%	9.1%	7.6%	7.5%
once a week	49.1%	41.2%	6.7%	47.1%	68.2%	30.6%	18.0%	30.0%	27.1%	14.0%	31.9%	30.5%	3.0%	12.9%	6.8%	16.5%	20.0%
2-3 times per month	11.6%	15.7%	6.7%	8.6%	0.0%	30.6%	18.0%	15.0%	4.7%	14.0%	11.7%	11.4%	7.1%	14.0%	4.5%	6.3%	10.0%
once a month	4.0%	3.9%	3.3%	2.9%	2.3%	16.7%	12.0%	20.0%	11.8%	4.0%	6.4%	3.8%	8.1%	12.4%	13.6%	8.9%	10.0%
Don't know	1.5%	0.0%	10.0%	1.4%	0.0%	0.0%	6.0%	20.0%	4.7%	4.0%	0.0%	0.0%	6.1%	2.2%	9.1%	1.3%	1.3%

Source: BTD Project Beneficiary Survey 2012-13

Table A8. Quantity and frequency of bean consumption and cooking practices reported by project beneficiary households, by Departments/Regions

	Guatemala					Honduras							Nicaragua				
	Hue-hueten	Quet-zalte	Quiche	San Marco	Toto-nicap	Atlantida	Copan	Inti-buca	Lem-pira	Ocote-peque	Santa Barbara	Yoro	Centro Norte	Centro Sur	Las Segovias	Pacifico Norte	Pacifico Sur
N =	**275**	**51**	**60**	**70**	**44**	**36**	**50**	**20**	**85**	**50**	**95**	**105**	**99**	**178**	**44**	**79**	**80**
Number of times the HH cooked beans for home consumption in the last 7 days	3.1	2.1	2.9	1.9	2.4	2.4	2.6	3.7	2.7	2.5	2.6	3.5	dnc	dnc	dnc	dnc	dnc
Average quantity of beans consumed by a typical HH over the past 7 days (lbs)	4.8	4.37	6.5	3.5	4.2	5.2	5.8	6.6	6.4	4.2	5.2	7.5	dnc	dnc	dnc	dnc	dnc
Average quantity of beans consumed per person per day (lbs/day/person)	0.12	0.11	0.17	0.07	0.11	0.16	0.14	0.19	0.17	0.14	0.18	0.21	dnc	dnc	dnc	dnc	dnc
Average time a typical HH cooked the beans for home consumption each time it cooked beans (minutes)	145	144	150	157	177	55	68	49	68	73	63	74	dnc	dnc	dnc	dnc	dnc
Average time HH spent cooking beans per unit of weight (minutes/lbs)	99	83	74	97	119	30	35	34	34	53	34	38	dnc	dnc	dnc	dnc	dnc
Percentage of HHs that soak beans before cooking	17.9%	62.7%	15.0%	24.3%	29.5%	11.1%	28.0%	50.0%	12.9%	16.0%	10.5%	20.0%	dnc	dnc	dnc	dnc	dnc
Main source of energy used for cooking beans (% of HHs)																	
Wood	97.8%	94.1%	98.3%	94.3%	100%	94.4%	98.0%	100%	97.6%	88.0%	98.9%	99.0%	dnc	dnc	dnc	dnc	dnc
Propane gas tank	1.8%	5.9%	1.7%	5.7%	0.0%	2.8%	2.0%	0.0%	1.2%	12.0%	0.0%	1.0%	dnc	dnc	dnc	dnc	dnc
Electricity	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%	0.0%	1.2%	0.0%	1.1%	0.0%	dnc	dnc	dnc	dnc	dnc
Other	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	dnc	dnc	dnc	dnc	dnc

Source: BTD Project Beneficiary Survey 2012-13

dnc=data not collected

\a Assumes that all beans cooked are typically consumed by household members and there is no wastage.

Table A9. Post-harvest bean storage practices and bruchid problem reported by the project beneficiary bean farmers, by Departments/Regions

	Guatemala					Honduras							Nicaragua				
	Hue-hueten	Quet-zalte	Quiche	San Marco	Toto-nicap	Atlantida	Copan	Inti-buca	Lem-pira	Ocote-peque	Santa Barbara	Yoro	Centro Norte	Centro Sur	Las Segovias	Pacifico Norte	Pacifico Sur
N =	275	51	60	70	44	36	50	20	85	50	95	105	99	178	44	79	80
Percentage of HHs using the following method of storing beans																	
Metal silos	1.5%	11.8%	1.7%	1.4%	13.6%	2.8%	8.0%	5.0%	15.3%	20.0%	13.8%	12.4%	dnc	dnc	dnc	dnc	dnc
Metal drum	0.4%	0.0%	5.0%	0.0%	2.3%	2.8%	4.0%	0.0%	2.4%	2.0%	7.4%	18.1%	dnc	dnc	dnc	dnc	dnc
plastic container with lid	1.1%	11.8%	13.3%	1.4%	15.9%	8.3%	0.0%	0.0%	0.0%	6.0%	1.1%	1.0%	dnc	dnc	dnc	dnc	dnc
plastic container without lid	0.7%	5.9%	8.3%	0.0%	2.3%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	dnc	dnc	dnc	dnc	dnc
sacks (polythylene or jute)	61.1%	19.6%	66.7%	85.7%	31.8%	80.6%	82.0%	90.0%	75.3%	62.0%	71.3%	65.7%	dnc	dnc	dnc	dnc	dnc
Plastic bags	24.7%	39.2%	0.0%	0.0%	6.8%	0.0%	2.0%	0.0%	2.4%	6.0%	2.1%	0.0%	dnc	dnc	dnc	dnc	dnc
No method (don't store beans)	4.7%	2.0%	3.3%	11.4%	11.4%	5.6%	4.0%	0.0%	0.0%	4.0%	0.0%	1.0%	dnc	dnc	dnc	dnc	dnc
Other	5.8%	9.8%	1.7%	0.0%	15.9%	0.0%	0.0%	5.0%	4.7%	0.0%	3.2%	1.9%	dnc	dnc	dnc	dnc	dnc
Percentage of HHs reporting bruchid problem in stored beans	72.7%	9.8%	1.7%	38.6%	34.1%	27.8%	60.0%	75.0%	54.1%	64.0%	53.7%	53.3%	dnc	dnc	dnc	dnc	dnc
Percentage of HHs using the following method to control bruchid damage on beans (% of HH reporting bruchid damage):																	
Nothing	12.5%	40.0%	0.0%	0.54	0.53	10.0%	26.7%	20.0%	8.7%	9.4%	23.5%	5.4%	dnc	dnc	dnc	dnc	dnc
Apply fostoxin/insecticide	62.0%	40.0%	100%	0.15	0.27	10.0%	26.7%	46.7%	67.4%	56.3%	35.3%	53.6%	dnc	dnc	dnc	dnc	dnc
Use other homemade remedies	25.5%	20.0%	0.0%	0.31	0.20	80.0%	46.7%	33.3%	23.9%	34.4%	41.2%	41.1%	dnc	dnc	dnc	dnc	dnc
Farmers' opinion on the consequences of bruchid problem if he/she did not use any method to control the pest as measured by percentage of bean grain lost at the end of... (%)																	
One month	17.0%	2.6%	0.0%	7.7%	1.9%	50.0%	31.5%	39.4%	51.1%	27.4%	42.4%	37.9%	dnc	dnc	dnc	dnc	dnc
Three months	42.6%	18.2%	5.0%	11.1%	12.6%	70.5%	61.3%	71.7%	81.0%	45.6%	52.6%	55.0%	dnc	dnc	dnc	dnc	dnc
Six months	52.5%	61.8%	5.0%	17.7%	33.7%	89.0%	81.7%	88.6%	91.8%	73.2%	56.5%	72.1%	dnc	dnc	dnc	dnc	dnc

Source: BTD Project Beneficiary Survey 2012-13

dnc=data not collected

Table A10. Information about the season in which the project seed was planted by surveyed beneficiaries, by Departments/Regions

	Guatemala					Honduras							Nicaragua				
	Hue-hueten	Quet-zalte	Quiche	San Marco	Toto-nicap	Atlantida	Copan	Inti-buca	Lem-pira	Ocote-peque	Santa Barbara	Yoro	Centro Norte	Centro Sur	Las Segovias	Pacifico Norte	Pacifico Sur
N =	275	51	60	70	44	36	50	20	85	50	95	105	99	178	44	79	80
Season in which the project seed was planted (% of farmers)																	
Primera 2011	--	--	--	--	--	--	--	--	--	--	--	--	18.2%	0.6%	4.5%	2.5%	2.5%
Postrera 2011	--	--	--	--	--	--	--	--	--	--	--	--	46.5%	57.9%	72.7%	86.1%	97.5%
Apante 2011-12	--	--	--	--	--	--	--	--	--	--	--	--	20.2%	38.8%	2.3%	0.0%	0.0%
Primera 2012	38.2%	78.4%	31.7%	62.9%	59.1%	58.3%	32.0%	20.0%	17.6%	28.0%	45.3%	22.9%	16.2%	2.8%	22.7%	11.4%	0.0%
Postrera 2012	56.0%	17.6%	11.7%	31.4%	27.3%	8.3%	8.0%	60.0%	45.9%	32.0%	18.9%	67.6%	--	--	--	--	--
Apante 2012-13	2.9%	0.0%	55.0%	0.0%	0.0%	25.0%	34.0%	5.0%	14.1%	18.0%	14.7%	2.9%	--	--	--	--	--
Primera 2013	2.9%	3.9%	0.0%	5.7%	13.6%	5.6%	24.0%	15.0%	22.4%	18.0%	18.9%	4.8%	--	--	--	--	--
Did not plant in any season	0.0%	0.0%	1.7%	0.0%	0.0%	2.8%	2.0%	0.0%	0.0%	4.0%	2.1%	1.9%	--	--	--	--	--
Percentage of HHs reported receiving seed from the project more than one time	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	0.0%	2.4%	0.0%	0.0%	2.9%	1.0%	0.0%	2.3%	0.0%	0.0%
Percentage of households reporting growing beans on the following numbers of parcels in that season																	
none	2.9%	3.9%	1.7%	5.7%	13.6%	2.8%	2.0%	0.0%	0.0%	4.0%	2.1%	1.9%	0.0%	0.0%	4.5%	0.0%	0.0%
one	88.0%	88.2%	98.3%	80.0%	81.8%	86.1%	94.0%	85.0%	91.8%	90.0%	95.8%	63.8%	87.9%	55.6%	63.6%	53.2%	57.5%
two	8.0%	3.9%	0.0%	12.9%	4.5%	11.1%	4.0%	15.0%	7.1%	4.0%	1.1%	30.5%	8.1%	38.2%	22.7%	45.6%	41.3%
three or more	1.1%	3.9%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	1.2%	2.0%	1.1%	3.8%	4.0%	6.2%	9.1%	1.3%	1.3%
Average number of parcels of agricultural land planted to beans in the season when project seed was planted	1.10	1.12	1.00	1.16	1.04	1.08	1.02	1.15	1.09	1.04	1.01	1.36	1.6	1.2	1.5	1.1	1.4
Total area cultivated to beans (manzana/HH)	0.12	0.10	0.10	0.09	0.09	0.32	0.42	0.33	0.38	0.53	0.37	0.64	0.84	0.93	1.21	1.39	1.17
Total area cultivated across all crops and all parcels in the season when project seed was planted (manzana)	1.00	0.32	0.63	0.60	0.51	0.38	1.74	1.07	1.39	5.22	3.31	0.89	4.9	1.9	4.8	9.4	5.9
Share of bean crop in total area cultivated by a HH (%)	12.0%	30.1%	16.3%	15.5%	16.7%	84.0%	24.0%	30.7%	27.2%	10.1%	11.2%	71.9%	17.1%	49.7%	25.4%	14.8%	20.0%
Percentage of farmers experiencing the following problems more in the season when project seed was planted than in the previous 2 years																	
Insects	63.6%	54.9%	38.3%	64.3%	56.8%	47.2%	36.0%	90.0%	74.1%	36.0%	51.6%	45.7%	44.4%	45.5%	63.6%	21.5%	27.5%
Disease	52.7%	56.9%	23.3%	52.9%	29.5%	55.6%	34.0%	65.0%	67.1%	30.0%	44.2%	52.4%	38.4%	31.5%	50.0%	21.5%	12.5%
Drought	28.7%	27.5%	33.3%	27.1%	22.7%	36.1%	40.0%	45.0%	63.5%	24.0%	29.5%	27.6%	20.2%	23.0%	34.1%	7.6%	7.5%
too much rain	24.0%	29.4%	31.7%	30.0%	34.1%	22.2%	8.0%	40.0%	10.6%	4.0%	25.3%	33.3%	44.4%	55.6%	43.2%	81.0%	65.0%

Source: BTD Project Beneficiary Survey 2012-13

\a For Nicaragua the area estimates correspond to project seed planted in Primera 2012

Table A11. Characteristics of parcels on which bean seeds received from the project were planted, by Department/Regions

	Guatemala					Honduras							Nicaragua				
	Hue-hueten	Quet-zalte	Quiche	San Marco	Toto-nicap	Atlantida	Copan	Inti-buca	Lem-pira	Ocote-peque	Santa Barbara	Yoro	Centro Norte	Centro Sur	Las Segovias	Pacifico Norte	Pacifico Sur
N=	**274**	**49**	**58**	**64**	**36**	**36**	**49**	**21**	**91**	**48**	**93**	**111**	**101**	**178**	**47**	**77**	**81**
Percentage of parcels with the following land tenure status																	
owned	86.1%	79.6%	79.3%	93.8%	91.7%	44.4%	65.3%	85.7%	84.6%	72.9%	74.2%	59.5%	64.4%	61.8%	72.3%	59.7%	46.9%
rented in	6.9%	16.3%	19.0%	0.0%	5.6%	44.4%	30.6%	9.5%	7.7%	25.0%	12.9%	18.9%	15.8%	21.3%	6.4%	23.4%	34.6%
shared	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%	0.0%	5.9%	1.1%	8.5%	5.2%	0.0%
borrowed	6.9%	4.1%	1.7%	6.3%	2.8%	11.1%	4.1%	4.8%	6.6%	2.1%	12.9%	21.6%	13.9%	11.2%	12.8%	11.7%	17.3%
government land	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.9%	0.0%	0.0%	1.2%
other	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.0%
Percentage of parcels when bean was inter-cropped	10.9%	8.2%	8.6%	9.4%	25.0%	2.8%	8.2%	52.4%	27.5%	10.4%	11.8%	21.6%	8.9%	6.7%	10.6%	1.3%	1.2%
Gender of the person responsible for the parcel (%)																	
male	86.1%	24.5%	79.3%	70.3%	50.0%	94.4%	98.0%	95.2%	96.7%	89.6%	90.3%	95.5%	dnc	dnc	dnc	dnc	dnc
female	13.9%	75.5%	20.7%	29.7%	50.0%	5.6%	2.0%	4.8%	3.3%	10.4%	9.7%	4.5%	dnc	dnc	dnc	dnc	dnc

Source: BTD Project Beneficiary Survey 2012-13

dnc=data not collected

Table A12. Bean area planted and use of inputs on parcels on which bean seeds received from the project were planted, by Departments/Regions

	Guatemala					Honduras							Nicaragua				
	Hue-hueten	Quet-zalte	Quiche	San Marco	Toto-nicap	Atlantida	Copan	Inti-buca	Lem-pira	Ocote-peque	Santa Barbara	Yoro	Centro Norte	Centro Sur	Las Segovias	Pacifico Norte	Pacifico Sur
N=	**274**	**49**	**58**	**64**	**36**	**36**	**49**	**21**	**91**	**48**	**93**	**111**	**101**	**178**	**47**	**77**	**81**
Total area planted to beans in the season when project seed was planted (after adjusting for intercropping) (manzana)	0.12	0.10	0.10	0.09	0.09	0.32	0.42	0.33	0.38	0.53	0.37	0.64	0.84	0.93	1.21	1.39	1.17
Average size of the bean parcel on which project seed was planted (manzana)	0.11	0.08	0.11	0.08	0.09	0.26	0.40	0.36	0.41	0.54	0.32	0.51	0.61	0.35	0.79	0.77	0.80
Average bean area planted in parcel where project seed was planted (after adjusting for inter-crop) (manzana)	0.10	0.08	0.10	0.07	0.08	0.25	0.39	0.24	0.34	0.52	0.30	0.42	0.58	0.34	0.74	0.77	0.80
Share of bean area planted with project seed in total area cultivated to beans in that season (%)	79%	83%	100%	75%	92%	79%	93%	74%	91%	98%	81%	67%	69%	36%	61%	55%	68%
Percentage of parcels that:																	
were irrigated	4.7%	8.2%	27.6%	14.1%	11.1%	2.8%	12.2%	38.1%	33.0%	35.4%	19.4%	3.6%	1.0%	1.7%	6.4%	2.6%	1.2%
applied insecticide	36.1%	42.9%	46.6%	9.4%	33.3%	47.2%	36.7%	81.0%	73.6%	56.3%	37.6%	56.8%	84.2%	75.8%	76.6%	67.5%	66.7%
fungicide	13.5%	42.9%	22.4%	1.6%	13.9%	30.6%	12.2%	66.7%	51.6%	47.9%	31.2%	45.9%	90.1%	89.3%	74.5%	89.6%	90.1%
chemial fertilizer	87.2%	81.6%	94.8%	46.9%	55.6%	33.3%	44.9%	100.0%	89.0%	79.2%	54.8%	61.3%	76.2%	64.0%	83.0%	85.7%	81.5%
Among those that used and reported the cost, average amount of money spent on the following inputs used on the bean crop (Local currency/manzana)																	
chemial fertilizer	130	115	131	95	253	167	714	895	668	796	553	224	1,954	881	539	728	585
herbicide	39	34	27	150	65	72	521	284	252	250	213	125	366	348	372	225	471
chemial pesticides	40	59	33	44	48	138	423	380	236	436	397	126	1,015	308	237	278	197
seed	0	0	0	0	0	0	83	67	75	0	0	0	0	0	0	0	0
hired labor	168	115	139	68	173	661	591	1,056	766	1,312	841	867	897	903	585	748	1,548
Percentage of farmers reporting that the seed planted was certified	76.6%	41.2%	75.9%	22.1%	39.0%	94.4%	81.6%	100%	95.6%	95.8%	94.6%	93.7%	0.0%	0.0%	0.0%	0.0%	0.0%

Source: BTD Project Beneficiary Survey 2012-13

\a For Nicaragua this statistic only reflects Primera 2012 season

\b Local currencies were converted into US$ using the following rate (prevalent at the end of 2011 and 2012): 1 US$ = 7.7 Quetzales for Guatemala, 1 US$=19.3 Lempiras for Honduras and 1 US$ = 22.29 Cordobas for Nicaragua

Table A13. Name of varieties received from the BTD project's distribution system as reported by the beneficiaries, by Departments/Regions

	Guatemala					Honduras							Nicaragua				
	Hue-hueten	Quet-zalte	Quiche	San Marco	Toto-nicap	Atlantida	Copan	Inti-buca	Lem-pira	Ocote-peque	Santa Barbara	Yoro	Centro Norte	Centro Sur	Las Segovias	Pacifico Norte	Pacifico Sur
N=	**282**	**51**	**58**	**68**	**41**	**36**	**49**	**21**	**91**	**48**	**93**	**111**	**101**	**178**	**47**	**77**	**81**
Percentage of farmers planted seeds of following varieties																	
ICTA Hunapu	65.6%	90.2%	91.4%	85.3%	97.6%	--	--	--	--	--	--	--	--	--	--	--	--
ICTA Ligero	23.4%	0.0%	0.0%	0.0%	0.0%	--	--	--	--	--	--	--	--	--	--	--	--
ICTA Peten	0.0%	0.0%	3.4%	0.0%	0.0%	--	--	--	--	--	--	--	--	--	--	--	--
Don't know the name	11.0%	9.8%	5.2%	14.7%	2.4%	19.4%	53.1%	19.0%	18.7%	25.0%	19.4%	3.6%	3.0%	1.7%	0.0%	0.0%	3.7%
Amadeus 77	--	--	--	--	--	44.4%	8.2%	9.5%	26.4%	27.1%	57.0%	6.3%	--	--	--	--	--
Cedron	--	--	--	--	--	5.6%	4.1%	23.8%	0.0%	0.0%	0.0%	52.3%	--	--	--	--	--
Deorho	--	--	--	--	--	5.6%	10.2%	4.8%	26.4%	25.0%	6.5%	0.0%	--	--	--	--	--
Macuzalito	--	--	--	--	--	0.0%	0.0%	28.6%	1.1%	0.0%	0.0%	13.5%	--	--	--	--	--
Tio Canela 75	--	--	--	--	--	0.0%	4.1%	0.0%	16.5%	0.0%	2.2%	0.0%	--	--	--	--	--
Chepe	--	--	--	--	--	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	16.2%	--	--	--	--	--
Carrizalito	--	--	--	--	--	0.0%	14.3%	9.5%	3.3%	2.1%	1.1%	0.9%	--	--	--	--	--
Cardenal	--	--	--	--	--	0.0%	2.0%	0.0%	4.4%	20.8%	0.0%	0.0%	--	--	--	--	--
Other	--	--	--	--	--	25.0%	4.1%	4.8%	3.3%	0.0%	14.0%	7.2%	7.9%	5.1%	8.5%	0.0%	0.0%
Inta Rojo	--	--	--	--	--	--	--	--	--	--	--	--	22.8%	89.9%	89.4%	100%	95.1%
Inta Matagalpa	--	--	--	--	--	--	--	--	--	--	--	--	18.8%	0.6%	0.0%	0.0%	0.0%
Inta sequia	--	--	--	--	--	--	--	--	--	--	--	--	47.5%	2.8%	2.1%	0.0%	1.2%
All	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: BTD Project Beneficiary Survey 2012-13

Table A14. Perception and opinion on varietal characteristics liked and disliked and plan for planting the variety in the next season, by Departments/Regions \a

	Guatemala					Honduras							Nicaragua				
	Hue-hueten	Quet-zalte	Quiche	San Marco	Toto-nicap	Atlantida	Copan	Inti-buca	Lem-pira	Ocote-peque	Santa Barbara	Yoro	Centro Norte	Centro Sur	Las Segovias	Pacifico Norte	Pacifico Sur
N=	**282**	**51**	**58**	**68**	**41**	**36.0**	**49.0**	**21.0**	**91**	**48**	**93**	**111**	**18**	**6**	**20**	**14**	**11**
Percentage of farmers who plan to grow the variety received in the next season	65.2%	51.0%	93.1%	79.4%	82.9%	52.8%	85.7%	85.7%	86.8%	68.8%	83.9%	64.9%	83.3%	100%	90.0%	92.9%	81.8%
Percentage of farmers that plan to change the area planted to a given variety in future																	
increase	41.7%	32.3%	38.2%	37.9%	28.2%	42.1%	53.3%	50.0%	56.6%	31.7%	56.4%	41.1%	55.6%	66.7%	20.0%	64.3%	27.3%
decrease	3.3%	3.2%	1.8%	6.9%	2.6%	15.8%	0.0%	0.0%	1.2%	0.0%	0.0%	8.2%	5.6%	0.0%	5.0%	7.1%	0.0%
no change	45.5%	38.7%	58.2%	39.7%	43.6%	42.1%	35.6%	50.0%	36.1%	63.4%	42.3%	47.9%	22.2%	33.3%	60.0%	14.3%	45.5%
don't know	9.5%	25.8%	1.8%	15.5%	25.6%	0.0%	11.1%	0.0%	6.0%	4.9%	1.3%	2.7%	16.7%	0.0%	15.0%	14.3%	27.3%
Farmers' perception on cooking time of the variety received from the BTD project (percentage of respondents)																	
fast or very fast	81.3%	18.8%	50.0%	65.1%	66.7%	100%	82.8%	88.2%	81.2%	82.1%	95.2%	77.2%	dnc	dnc	dnc	dnc	dnc
regular	8.6%	20.8%	1.7%	20.6%	13.9%	0.0%	6.9%	11.8%	17.4%	10.3%	4.8%	6.9%	dnc	dnc	dnc	dnc	dnc
slow or very slow	3.9%	22.9%	0.0%	0.0%	16.7%	0.0%	6.9%	0.0%	1.4%	7.7%	0.0%	15.8%	dnc	dnc	dnc	dnc	dnc
don't know	6.2%	37.5%	48.3%	14.3%	2.8%	0.0%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%	dnc	dnc	dnc	dnc	dnc

Source: BTD Project Beneficiary Survey 2012-13

\a For Nicaragua the results reported in this table only reflect beneficiaries that planted the project seed in the Primera 2012 season

Table A15. Quantity of planted seed and main sources of seed received from the BTD project, by Departments/Regions

	Guatemala					Honduras							Nicaragua				
	Hue-hueten	Quet-zalte	Quiche	San Marco	Toto-nicap	Atlantida	Copan	Inti-buca	Lem-pira	Ocote-peque	Santa Barbara	Yoro	Centro Norte	Centro Sur	Las Segovias	Pacifico Norte	Pacifico Sur
N=	**282**	**51**	**58**	**68**	**41**	**36**	**49**	**21**	**91**	**48**	**93**	**111**	**101**	**178**	**47**	**77**	**81**
Quantity of BTD project seed planted(lbs)	6.5	3.7	4.9	3.0	2.9	21.4	24.3	23.5	23.0	28.7	25.9	32.2	60.8	28.5	58.1	57.4	57.8
Main sources of seed received (% of parcels)																	
Received from an NGO	2.1%	0.0%	0.0%	0.0%	12.2%	--	--	--	--	--	--	--	--	--	--	--	--
Received from SOSEP	0.0%	2.0%	0.0%	64.7%	80.5%	--	--	--	--	--	--	--	--	--	--	--	--
Received from a municipality office	25.5%	78.4%	0.0%	26.5%	0.0%	--	--	--	--	--	--	--	--	--	--	--	--
Received from MAGA	63.8%	0.0%	100%	4.4%	7.3%	--	--	--	--	--	--	--	--	--	--	--	--
Received from ICTA	0.4%	0.0%	0.0%	0.0%	0.0%	--	--	--	--	--	--	--	--	--	--	--	--
Other	5.7%	17.6%	0.0%	2.9%	0.0%	30.6%	4.1%	0.0%	11.0%	0.0%	9.7%	0.9%	--	--	--	--	--
don't know	2.5%	2.0%	0.0%	1.5%	0.0%	0.0%	10.2%	0.0%	1.1%	2.1%	0.0%	1.8%	--	--	--	--	--
DICTA/SAG	--	--	--	--	--	63.9%	53.1%	19.0%	65.9%	87.5%	28.0%	0.9%	--	--	--	--	--
CIAL	--	--	--	--	--	0.0%	10.2%	33.3%	2.2%	6.3%	4.3%	57.7%	--	--	--	--	--
FIPAH	--	--	--	--	--	0.0%	0.0%	47.6%	1.1%	0.0%	0.0%	27.0%	--	--	--	--	--
PRR	--	--	--	--	--	0.0%	0.0%	0.0%	2.2%	0.0%	28.0%	0.0%	--	--	--	--	--
USAID	--	--	--	--	--	0.0%	22.4%	0.0%	14.3%	4.2%	1.1%	0.0%	--	--	--	--	--
FAO	--	--	--	--	--	0.0%	0.0%	0.0%	0.0%	0.0%	17.2%	9.9%	--	--	--	--	--
Zamorano	--	--	--	--	--	5.6%	0.0%	0.0%	2.2%	0.0%	1.1%	1.8%	--	--	--	--	--
Bolsa Samaritana	--	--	--	--	--	0.0%	0.0%	0.0%	0.0%	0.0%	10.8%	0.0%	--	--	--	--	--
Seed bank	--	--	--	--	--	--	--	--	--	--	--	--	100%	100%	100%	100%	100%

Source: BTD Project Beneficiary Survey 2012-13

Table A16. Total beans harvested as greed pods and as grain on parcels where project seeds were planted and how the harvest was used, by Departments/Regions

	Guatemala					Honduras							Nicaragua				
	Hue-hueten	Quet-zalte	Quiche	San Marco	Toto-nicap	Atlantida	Copan	Inti-buca	Lem-pira	Ocote-peque	Santa Barbara	Yoro	Centro Norte	Centro Sur	Las Segovias	Pacifico Norte	Pacifico Sur
N=	**282**	**51**	**58**	**68**	**41**	**36.0**	**49.0**	**21.0**	**91**	**48**	**93**	**111**	**101**	**178**	**47**	**77**	**81**
% of parcels on which beans were harvested as green pods	37.5%	66.7%	51.7%	40.3%	65.9%	0.0%	14.3%	33.3%	24.2%	29.2%	20.4%	8.1%	dnc	dnc	dnc	dnc	dnc
Among those that harvested as green pods, percentage of beans harvested in that stage:																	
N=	**98**	**35**	**30**	**37**	**28**	**0**	**7**	**7**	**22**	**14**	**19**	**9**	**dnc**	**dnc**	**dnc**	**dnc**	**dnc**
less than 25%	77.6%	17.1%	86.7%	56.8%	39.3%	-	85.7%	71.4%	77.3%	92.9%	84.2%	66.7%	dnc	dnc	dnc	dnc	dnc
33%	2.0%	11.4%	0.0%	10.8%	32.1%	-	0.0%	0.0%	4.5%	0.0%	0.0%	22.2%	dnc	dnc	dnc	dnc	dnc
50%	4.1%	14.3%	6.7%	2.7%	0.0%	-	0.0%	0.0%	4.5%	0.0%	0.0%	0.0%	dnc	dnc	dnc	dnc	dnc
67%	0.0%	5.7%	0.0%	2.7%	3.6%	-	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	dnc	dnc	dnc	dnc	dnc
75%	0.0%	34.3%	0.0%	2.7%	0.0%	-	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	dnc	dnc	dnc	dnc	dnc
more than 75%	1.0%	0.0%	0.0%	0.0%	21.4%	-	14.3%	28.6%	13.6%	7.1%	10.5%	0.0%	dnc	dnc	dnc	dnc	dnc
don't know	15.3%	17.1%	6.7%	16.2%	3.6%	-	0.0%	0.0%	0.0%	0.0%	5.3%	11.1%	dnc	dnc	dnc	dnc	dnc
Percentage of farmers reporting the following use of green pods harvested																	
sold all	1.0%	17.6%	93.3%	0.0%	0.0%	-	0.0%	0.0%	0.0%	7.1%	5.3%	0.0%	dnc	dnc	dnc	dnc	dnc
consumed all	91.4%	61.8%	3.3%	100%	77.8%	-	0.0%	100.0%	27.3%	142.9%	68.4%	200%	dnc	dnc	dnc	dnc	dnc
part sold, part consumed	3.8%	17.6%	3.3%	0.0%	22.2%	-	0.0%	0.0%	4.5%	7.1%	0.0%	0.0%	dnc	dnc	dnc	dnc	dnc
Total quantity of bean grain harvested (lbs/parcel)	52.1	39.7	109	33.7	39.2	226	242	340.8	629	616.4	504	444	604.0	3,209	563	545	573.5
Total quantity of beans harvested per unit of area planted (lbs/manzana)	661	695	1,434	657	747	701	704	1,426	1702	1555.2	1624	1077	1231.6	1062.4	888.6	672.9	643.1
Total quantity of beans harvested per unit of seed planted (lbs of grain/lbs of seed)	10.1	13.5	27.3	14.0	15.1	9.1	10.2	13.9	29.7	10.1	19.7	15.3	14.2	12.1	9.4	9.2	8.4
Percentage of total grain harvested:																	
lost due to pest or other reason	3.0%	8.3%	0.2%	2.3%	1.3%	0.0%	3.2%	7.4%	2.5%	0.4%	1.5%	2.1%	1.3%	6.9%	3.6%	0.0%	4.9%
kept as food	80.9%	63.0%	24.7%	86.0%	75.8%	59.6%	40.6%	55.7%	60.9%	46.7%	57.3%	48.0%	41.2%	39.8%	36.1%	39.2%	35.3%
kept as seed	11.0%	11.3%	7.8%	9.4%	13.0%	8.0%	19.2%	15.1%	7.1%	26.4%	5.4%	5.9%	26.3%	16.2%	16.4%	14.1%	8.6%
sold	4.1%	17.4%	67.3%	2.4%	10.0%	10.3%	21.5%	17.1%	22.4%	24.6%	24.1%	24.5%	12.4%	11.1%	22.8%	19.0%	23.5%
used for other purpose	0.9%	0.0%	0.1%	0.0%	0.0%	1.6%	1.7%	4.7%	4.3%	4.0%	6.8%	14.3%	18.7%	26.0%	21.1%	27.7%	27.7%
Average price received for the largest quantity sale of beans sold (local currency/lbs)	4.8	6.8	4.9	5.7	6.6	6.56	7.56	8.28	7.32	6.26	7.18	5.22	7.00	6.53	7.42	7.93	7.23
Average price received for the largest quantity sale of beans sold (US$/lbs)	$ 0.6	$ 0.9	$ 0.64	$ 0.7	$ 0.9	$ 0.3	$ 0.4	$ 0.43	$ 0.4	$ 0.32	$ 0.4	$ 0.3	$ 0.31	$ 0.29	$ 0.3	$ 0.4	$ 0.32
exchange rate LCU/US$	7.7	7.7	7.7	7.7	7.7	19.3	19.3	19.3	19.3	19.3	19.3	19.3	22.3	22.3	22.3	22.3	22.3

Source: BTD Project Beneficiary Survey 2012-13

dnc=data not collected

\b Most of these responses on 'other purpose' relate to in-kind payment made to the local community seed bank

Table A17. Beneficiary perspective on the quality of seed received, by Departments/Regions

	Guatemala					Honduras							Nicaragua				
	Hue-hueten	Quet-zalte	Quiche	San Marco	Toto-nicap	Atlantida	Copan	Inti-buca	Lem-pira	Ocote-peque	Santa Barbara	Yoro	Centro Norte	Centro Sur	Las Segovias	Pacifico Norte	Pacifico Sur
N =	**275**	**51**	**60**	**70**	**44**	**36**	**50**	**20**	**85**	**50**	**95**	**105**	**99**	**178**	**44**	**79**	**80**
Type of package in which the seed was received (% of respondents)																	
sealed package with a label	68%	12%	88%	21%	14%	67%	90%	70%	80%	92%	79%	90%	15.2%	38.8%	25.0%	32.9%	27.5%
open bag with a label	26%	10%	2%	27%	20%	3%	2%	20%	6%	2%	4%	5%	6.1%	5.6%	0.0%	1.3%	20.0%
sealed package without a label	1%	0%	2%	0%	2%	0%	6%	0%	8%	6%	0%	1%	4.0%	3.9%	4.5%	2.5%	0.0%
open bag without a label	4%	75%	7%	51%	64%	31%	2%	10%	6%	0%	15%	3%	44.4%	11.8%	47.7%	55.7%	37.5%
other or don't know	0%	4%	2%	0%	0%	0%	0%	0%	0%	0%	2%	1%	30.3%	39.9%	22.7%	7.6%	15.0%
Among those that reported receiving seeds with a label, type of information included on the label (% of respondents)																	
variety name																	
Yes	64.1%	90.9%	75.9%	47.1%	80.0%	64.7%	80.0%	83.3%	75.7%	80.0%	81.2%	93.1%	95.2%	98.7%	90.9%	100.0%	92.1%
No	0.8%	0.0%	0.0%	2.9%	0.0%	23.5%	4.0%	0.0%	9.5%	2.0%	4.7%	2.9%	0.0%	1.3%	0.0%	0.0%	0.0%
don't know	35.1%	9.1%	24.1%	50.0%	20.0%	11.8%	16.0%	16.7%	14.9%	18.0%	14.1%	3.9%	4.8%	0.0%	9.1%	0.0%	7.9%
Germination rate																	
Yes	59.5%	90.9%	11.1%	38.2%	60.0%	44.1%	44.0%	50.0%	60.8%	54.0%	68.2%	72.5%	90.5%	88.6%	63.6%	51.9%	55.3%
No	1.2%	0.0%	3.7%	5.9%	0.0%	23.5%	8.0%	0.0%	5.4%	2.0%	8.2%	7.8%	4.8%	8.9%	0.0%	48.1%	26.3%
don't know	39.4%	9.1%	85.2%	55.9%	40.0%	32.4%	48.0%	50.0%	33.8%	44.0%	23.5%	19.6%	4.8%	2.5%	36.4%	0.0%	18.4%
Weight																	
Yes	63.7%	90.9%	11.1%	47.1%	73.3%	64.7%	80.0%	94.4%	77.0%	86.0%	84.7%	89.2%	85.7%	94.9%	90.9%	96.3%	92.1%
No	0.8%	0.0%	3.7%	0.0%	0.0%	23.5%	8.0%	0.0%	9.5%	2.0%	4.7%	2.9%	9.5%	3.8%	0.0%	3.7%	2.6%
don't know	35.5%	9.1%	85.2%	52.9%	26.7%	11.8%	12.0%	5.6%	13.5%	12.0%	10.6%	7.8%	4.8%	1.3%	9.1%	0.0%	5.3%
Date of production																	
Yes	58.7%	90.9%	3.7%	47.1%	66.7%	50.0%	44.0%	61.1%	62.2%	55.1%	69.4%	79.4%	81.0%	91.1%	54.5%	55.6%	57.9%
No	0.8%	0.0%	5.6%	0.0%	0.0%	23.5%	8.0%	0.0%	5.4%	2.0%	8.2%	3.9%	4.8%	6.3%	0.0%	37.0%	23.7%
don't know	40.5%	9.1%	88.9%	52.9%	33.3%	26.5%	48.0%	38.9%	32.4%	42.9%	22.4%	16.7%	14.3%	2.5%	45.5%	7.4%	18.4%
Farmers' rating on the quality of seed received compared with other seed planted in that season (% of respondents)																	
lower quality	20.9%	45.1%	17.5%	16.4%	20.5%	36.1%	20.8%	0.0%	2.4%	12.8%	6.3%	19.0%	8.1%	6.7%	11.4%	8.9%	21.3%
similar quality	31.1%	23.5%	17.5%	31.3%	20.5%	19.4%	29.2%	50.0%	40.0%	8.5%	33.7%	22.9%	25.3%	16.9%	25.0%	29.1%	33.8%
higher quality	46.9%	29.4%	52.6%	49.3%	47.7%	41.7%	43.8%	50.0%	57.6%	74.5%	56.8%	56.2%	66.7%	76.4%	61.4%	62.0%	45.0%
don't know	1.1%	2.0%	12.3%	3.0%	11.4%	2.8%	6.3%	0.0%	0.0%	4.3%	3.2%	1.9%	0.0%	0.0%	2.3%	0.0%	0.0%

Source: BTD Project Beneficiary Survey 2012-13

Table A18. Farmers' opinion on service provided by the seed distribution system used by the BTD project and prospects of future purchase of seed from the same source, by Departments/Regions

	Guatemala					Honduras							Nicaragua				
	Hue-hueten	Quet-zalte	Quiche	San Marco	Toto-nicap	Atlantida	Copan	Inti-buca	Lem-pira	Ocote-peque	Santa Barbara	Yoro	Centro Norte	Centro Sur	Las Segovias	Pacifico Norte	Pacifico Sur
N =	**275**	**51**	**60**	**70**	**44**	**36**	**50**	**20**	**85**	**50**	**95**	**105**	**99**	**178**	**44**	**79**	**80**
How was the seed delivered to the farmer (% of respondents)																	
It was delivered in the community where the farmer resided	61.1%	13.7%	63.3%	37.1%	90.9%	91.7%	94.0%	85.0%	50.6%	70.0%	88.4%	85.7%	90.9%	59.0%	54.5%	29.1%	67.5%
the farmer had to travel outside the community to get the seed	38.9%	86.3%	36.7%	62.9%	9.1%	8.3%	6.0%	15.0%	49.4%	30.0%	11.6%	14.3%	9.1%	41.0%	45.5%	70.9%	32.5%
Among those that had to travel outside to access seed, average distance traveled (km)	3.02	3.36	15.64	10.93	6.00	21.30	11.67	19.00	17.45	9.10	10.18	9.60					
When did the farmer receive the seed in relation to the planting timeframe (% of respondents)																	
3-6 months before	0.0%	0.0%	0.0%	0.0%	0.0%	13.9%	30.0%	40.0%	43.5%	68.0%	30.5%	14.3%	0.0%	0.0%	2.3%	0.0%	0.0%
One month before	29.1%	0.0%	35.0%	10.0%	4.5%	33.3%	40.0%	30.0%	28.2%	18.0%	46.3%	70.5%	40.4%	37.1%	20.5%	19.0%	7.5%
One week before	33.1%	19.6%	31.7%	25.7%	22.7%	11.1%	0.0%	10.0%	1.2%	2.0%	7.4%	8.6%	36.4%	50.6%	50.0%	58.2%	63.8%
Less than one week	6.9%	13.7%	30.0%	5.7%	2.3%	38.9%	24.0%	5.0%	15.3%	6.0%	11.6%	5.7%	8.1%	2.8%	13.6%	17.7%	18.8%
After the date s/he was planning to plant	29.5%	66.7%	1.7%	58.6%	70.5%	0.0%	4.0%	15.0%	10.6%	4.0%	4.2%	1.0%	15.2%	9.6%	13.6%	5.1%	10.0%
No response	1.5%	0.0%	1.7%	0.0%	0.0%	2.8%	2.0%	0.0%	1.2%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Payment agreement on the seed received from the BTD project seed provider (% of farmers who...)																	
received the seed free of cost	55.1%	98.0%	70.6%	98.6%	97.7%	19.4%	60.0%	30.0%	87.1%	82.0%	54.7%	1.0%	13.1%	2.2%	2.3%	6.3%	1.3%
paid cash	1.1%	0.0%	0.0%	0.0%	0.0%	5.6%	0.0%	20.0%	8.2%	2.0%	1.1%	1.9%	4.0%	6.2%	6.8%	17.7%	8.8%
returned same amount of grain after harvest	41.2%	2.0%	27.5%	1.4%	0.0%	8.3%	36.0%	30.0%	2.4%	16.0%	34.7%	16.2%	66.7%	15.7%	65.9%	46.8%	40.0%
returned twice the grain after harvest	2.6%	0.0%	0.0%	0.0%	0.0%	63.9%	2.0%	0.0%	1.2%	0.0%	5.3%	80.0%	3.0%	75.8%	25.0%	26.6%	42.5%
did not pay anything to the seed provider, but had to share some harvested grain with other farmers	0.0%	0.0%	2.0%	0.0%	2.3%	2.8%	2.0%	10.0%	1.2%	0.0%	0.0%	1.0%	11.1%	0.0%	0.0%	2.5%	7.5%
had other arrangement	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%	0.0%	0.0%	4.2%	0.0%	2.0%	0.0%	0.0%	0.0%	0.0%
Farmers' opinion on whether the payment agreement was…(% of respondents that paid for 1 lbs seed wtih 1 lbs grain)																	
N=	**86**	**1**	**12**	**1**	**0**	**3**	**18**	**6**	**2**	**8**	**33**	**17**	**66**	**28**	**29**	**37**	**32**
lower than his/her willingness to pay	9.3%	100%	58.3%	0.0%	--	0.0%	16.7%	50.0%	0.0%	0.0%	12.1%	0.0%	7.6%	21.4%	3.4%	0.0%	3.1%
at par with his/her willingness to pay	86.0%	0.0%	41.7%	100%	--	100%	77.8%	33.3%	100%	87.5%	81.8%	100%	92.4%	71.4%	93.1%	94.6%	90.6%
higher than his/her willingness to pay	4.7%	0.0%	0.0%	0.0%	--	0.0%	5.6%	16.7%	0.0%	0.0%	3.0%	0.0%	0.0%	7.1%	3.4%	5.4%	6.3%
Farmers' opinion on whether the payment agreement was…(% of respondents that paid for 1 lbs seed with 2 lbs grain)																	
N=	**3**	**0**	**0**	**0**	**0**	**23**	**1**	**0**	**1**	**0**	**5**	**84**	**3**	**135**	**11**	**21**	**34**
lower than his/her willingness to pay	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	--	0.0%	--	0.0%	2.4%	0.0%	2.2%	9.1%	0.0%	0.0%
at par with his/her willingness to pay	33.0%	0.0%	0.0%	0.0%	0.0%	95.7%	100%	--	100%	--	80.0%	94.0%	100%	92.6%	72.7%	95.2%	91.2%
higher than his/her willingness to pay	67.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	--	0.0%	--	20.0%	2.4%	0.0%	5.2%	18.2%	4.8%	8.8%
Farmers willingness to purchase/seek seed from the same source he/she obtained the project seed (% of respondents)																	
yes	45.6%	56.0%	85.0%	62.9%	59.1%	61.1%	62.0%	80.0%	89.4%	76.0%	86.3%	68.6%	88.9%	93.3%	70.5%	75.9%	83.8%
no	39.1%	24.0%	11.7%	21.4%	20.5%	38.9%	18.0%	20.0%	9.4%	14.0%	11.6%	27.6%	6.1%	4.5%	18.2%	21.5%	12.5%
don't know	15.3%	20.0%	3.3%	15.7%	20.5%	0.0%	20.0%	0.0%	1.2%	10.0%	2.1%	3.8%	5.1%	2.2%	11.4%	2.5%	3.8%

Source: BTD Project Beneficiary Survey 2012-13

Table A20. Farmers' opinion on the payment arrangements for seed received, by Departments/Regions

	Guatemala					Honduras							Nicaragua				
	Hue-hueten	Quet-zalte	Quiche	San Marco	Toto-nicap	Atlantida	Copan	Inti-buca	Lem-pira	Ocote-peque	Santa Barbara	Yoro	Centro Norte	Centro Sur	Las Segovias	Pacifico Norte	Pacifico Sur
N =	**275**	**51**	**60**	**70**	**44**	**36**	**50**	**20**	**85**	**50**	**95**	**105**	**99**	**178**	**44**	**79**	**80**
Farmers' knowledge and awareness about certified seeds (% of respondents who...)																	
know what is certified seed	79.6%	94.1%	91.5%	54.3%	75.0%	100%	100%	100%	100%	100%	100%	100%	99.0%	98.3%	97.7%	97.5%	93.8%
don't know what is certified seed	20.4%	5.9%	8.5%	45.7%	25.0%	0%	0%	0%	0%	0%	0%	0%	1.0%	1.7%	2.3%	2.5%	6.3%
Percentage of farmers that have easy access to certified seeds of bean	15.6%	7.8%	16.9%	38.6%	22.7%	58.3%	4.0%	35.0%	45.9%	40.0%	42.1%	61.9%	53.5%	37.1%	56.8%	3.8%	10.0%
Percentage of farmers who have used certified bean seed and mode of acquisition																	
Have used it, it was given free of cost	35.6%	64.7%	13.6%	10.0%	15.9%	41.7%	64.0%	55.0%	60.0%	76.0%	62.1%	23.8%	34.3%	11.2%	20.5%	0.0%	11.3%
Have used it , it was purchased	10.5%	2.0%	52.5%	4.3%	0.0%	52.8%	2.0%	15.0%	9.4%	8.0%	15.8%	63.8%	43.4%	30.3%	54.5%	7.6%	23.8%
Have not used it	53.8%	33.3%	33.9%	85.7%	84.1%	5.6%	34.0%	30.0%	30.6%	16.0%	22.1%	12.4%	22.2%	58.4%	25.0%	92.4%	65.0%
If easily available and affordable, how frequently farmers would purchase certified bean seed (% of respondents)																	
Every planting season	18.5%	56.9%	73.3%	40.0%	25.0%	63.9%	24.0%	15.0%	60.5%	36.0%	42.1%	36.5%	34.3%	11.2%	36.4%	20.3%	33.8%
once a year	24.4%	11.8%	16.7%	11.4%	0.0%	33.3%	50.0%	40.0%	19.8%	32.0%	22.1%	46.2%	33.3%	20.8%	27.3%	7.6%	22.5%
once every two years	10.2%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	1.2%	4.0%	2.1%	1.9%	6.1%	2.2%	6.8%	0.0%	1.3%
once every three years	5.1%	0.0%	3.3%	0.0%	0.0%	0.0%	0.0%	5.0%	1.2%	0.0%	0.0%	0.0%	2.0%	2.2%	4.5%	0.0%	1.3%
less frequently than 3 years	0.7%	0.0%	0.0%	1.4%	0.0%	0.0%	0.0%	5.0%	1.2%	0.0%	0.0%	0.0%	1.0%	4.5%	0.0%	0.0%	1.3%
would not purchase certified seed	41.1%	29.4%	6.7%	47.1%	75.0%	2.8%	26.0%	30.0%	16.0%	28.0%	33.7%	15.4%	23.2%	59.0%	25.0%	72.2%	40.0%
Average quantity of certified seed a farmer would be willing to buy at a given frequency (average across all frequencies) (lbs)	4.89	4.12	5.33	2.24	2.07	36.4	43.4	52.5	35.1	54.7	39.3	45.3	66.9	26.3	46.7	21.6	38.3
Average quantity of certified seed a farmer would be willing to buy at a given frequency (excluding zero frequency) (lbs)	8.30	5.84	5.71	4.24	8.28	37.44	58.65	75.00	41.81	75.97	59.26	53.54	87.1	64.1	62.3	77.6	63.8
If easily available and affordable, how frequently farmers would purchaseapta bean seed from the source that provided BTD project seeds (% of respondents)																	
Every planting season	36.8%	24.4%	50.0%	21.2%	7.0%	55.6%	20.0%	25.0%	60.0%	32.0%	54.7%	41.9%	58.6%	19.1%	50.0%	41.8%	58.8%
once a year	39.5%	46.7%	30.8%	27.3%	39.5%	30.6%	40.0%	75.0%	29.4%	42.0%	28.4%	41.0%	31.3%	62.4%	29.5%	34.2%	26.3%
once every two years	1.3%	2.2%	3.8%	12.1%	18.6%	2.8%	0.0%	0.0%	0.0%	4.0%	2.1%	1.9%	5.1%	6.2%	6.8%	3.8%	1.3%
once every three years	0.0%	0.0%	0.0%	7.6%	2.3%	2.8%	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	2.2%	4.5%	0.0%	0.0%
less frequently than 3 years	1.3%	0.0%	0.0%	7.6%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%	1.0%	6.2%	2.3%	0.0%	0.0%
would not purchase this type of seed	21.1%	26.7%	15.4%	24.2%	32.6%	8.3%	40.0%	0.0%	8.2%	22.0%	14.7%	14.3%	4.0%	3.9%	6.8%	20.3%	13.8%
Average quantity of seed a farmer would be willing to buy at a given frequency (average across all frequencies) (lbs)	5.6	5.2	6.2	2.6	5.0	37.7	46.8	39.8	37.9	44.0	39.4	46.1	94.4	69.7	67.4	79.0	71.2
Average quantity of seed a farmer would be willing to buy at a given frequency (excluding zero frequency) (lbs)	7.0	7.1	7.4	3.5	7.4	41.1	78.0	39.8	41.3	56.4	46.2	53.7	98.3	72.5	72.4	99.1	82.5

Source: BTD Project Beneficiary Survey 2012-13

\a too few observations to report the mean

Table A21. Beneficiary perspective on the quantity of seed received and willingness to pay for additional quantity, if needed more, by Department/Regions

	Guatemala					Honduras							Nicaragua				
	Hue-hueten	Quet-zalte	Quiche	San Marco	Toto-nicap	Atlantida	Copan	Inti-buca	Lem-pira	Ocote-peque	Santa Barbara	Yoro	Centro Norte	Centro Sur	Las Segovias	Pacifico Norte	Pacifico Sur
N =	**275**	**51**	**60**	**70**	**44**	**36**	**50**	**20**	**85**	**50**	**95**	**105**	**99**	**178**	**44**	**79**	**80**
Average quantity of seed received from the BTD project (lbs)	8.0	4.1	5.2	5.3	4.0	21.9	24.4	24.4	23.8	28.7	26.1	33.5	31.2	23.7	53.2	52.8	59.5
Was the quantity of seed received adequate for the farmers' needs? (percentage of respondents)																	
yes	79.6%	56.9%	71.7%	84.3%	68.2%	94.4%	76.0%	70.0%	87.1%	92.0%	86.3%	86.7%	52.5%	55.1%	70.5%	63.3%	48.8%
no, wanted more	20.4%	43.1%	28.3%	15.7%	31.8%	5.6%	24.0%	30.0%	12.9%	8.0%	13.7%	13.3%	47.5%	44.9%	29.5%	36.7%	51.3%
Those that indicated wanting more seed, quantity of seed of that variety needed that season and farmers' willingness to pay																	
N=	**219**	**29**	**43**	**59**	**30**	**2**	**12**	**2**	**11**	**4**	**13**	**14**	**47**	**80**	**13**	**29**	**41**
Additional quantity needed (lbs)	12.1	8.0	4.1	2.4	9.3	50.0	51.2	30.8	45.5	45.0	40.5	45.9	102.2	76.0	62.0	53.8	44.9
Willingness to pay for seed (local currency/lbs)	9.4	5.9	6.3	6.2	3.8	6.5	15.1	12.3	19.0	9.8	11.9	8.5	6.6	10.9	6.5	9.4	9.6
Willingness to pay for seed--mean (US$/lbs)	$1.23	$0.77	$0.82	$0.81	$0.50	$0.34	$0.78	$0.64	$0.98	$ 0.51	$ 0.62	$0.44	$ 0.30	$ 0.49	$0.29	$ 0.42	$ 0.43
exchange rate LCU/US$	7.67	7.67	7.67	7.67	7.67	19.3	19.3	19.3	19.3	19.3	19.3	19.3	22.29	22.29	22.29	22.29	22.29
Seed price premium willing to pay (in relation to grain price)	1.79	1.12	1.20	1.18	0.72	0.98	2.28	1.86	2.87	1.47	1.80	1.28	0.91	1.50	0.89	1.29	1.31
average grain price received by farmers	5.26	5.26	5.26	5.26	5.26	6.63	6.63	6.63	6.63	6.63	6.63	6.63	7.3	7.3	7.3	7.3	7.3
% of farmers willing to pay for seed more than the average price of grain:	30.4%	47.6%	72.7%	54.5%	28.6%	50.0%	90.0%	83.3%	77.8%	75.0%	100%	57.1%	42.6%	87.5%	38.5%	93.1%	90.2%
% of farmers willing to pay for seed more than twice the average price of grain:	13.0%	4.8%	0.0%	0.0%	0.0%	0.0%	60.0%	16.7%	66.7%	0.0%	33.3%	14.3%	0.0%	17.5%	0.0%	0.0%	2.4%

Source: BTD Project Beneficiary Survey 2012-13

\a In Nicaragua other types of packaging reported includes *'a granel'*, sack and '*en una pana'*

Table A22. Farmers' access to certified seeds and potential demand as expressed by the quantity and frequency of purchase of certified seed, by Departments/Regions

	Guatemala					Honduras							Nicaragua				
	Hue-hueten	Quet-zalte	Quiche	San Marco	Toto-nicap	Atlantida	Copan	Inti-buca	Lem-pira	Ocote-peque	Santa Barbara	Yoro	Centro Norte	Centro Sur	Las Segovias	Pacifico Norte	Pacifico Sur
N =	**275**	**51**	**60**	**70**	**44**	**36**	**50**	**20**	**85**	**50**	**95**	**105**	**99**	**178**	**44**	**79**	**80**
Farmers' knowledge and awareness about certified seeds (% of respondents who...)																	
know what is certified seed	79.6%	94.1%	91.5%	54.3%	75.0%	100%	100%	100%	100%	100%	100%	100%	99.0%	98.3%	97.7%	97.5%	93.8%
don't know what is certified seed	20.4%	5.9%	8.5%	45.7%	25.0%	0%	0%	0%	0%	0%	0%	0%	1.0%	1.7%	2.3%	2.5%	6.3%
Percentage of farmers that have easy access to certified seeds of bean	15.6%	7.8%	16.9%	38.6%	22.7%	58.3%	4.0%	35.0%	45.9%	40.0%	42.1%	61.9%	53.5%	37.1%	56.8%	3.8%	10.0%
Percentage of farmers who have used certified bean seed and mode of acquisition																	
Have used it, it was given free of cost	35.6%	64.7%	13.6%	10.0%	15.9%	41.7%	64.0%	55.0%	60.0%	76.0%	62.1%	23.8%	34.3%	11.2%	20.5%	0.0%	11.3%
Have used it , it was purchased	10.5%	2.0%	52.5%	4.3%	0.0%	52.8%	2.0%	15.0%	9.4%	8.0%	15.8%	63.8%	43.4%	30.3%	54.5%	7.6%	23.8%
Have not used it	53.8%	33.3%	33.9%	85.7%	84.1%	5.6%	34.0%	30.0%	30.6%	16.0%	22.1%	12.4%	22.2%	58.4%	25.0%	92.4%	65.0%
If easily available and affordable, how frequently farmers would purchase certified bean seed (% of respondents)																	
Every planting season	18.5%	56.9%	73.3%	40.0%	25.0%	63.9%	24.0%	15.0%	60.5%	36.0%	42.1%	36.5%	34.3%	11.2%	36.4%	20.3%	33.8%
once a year	24.4%	11.8%	16.7%	11.4%	0.0%	33.3%	50.0%	40.0%	19.8%	32.0%	22.1%	46.2%	33.3%	20.8%	27.3%	7.6%	22.5%
once every two years	10.2%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	1.2%	4.0%	2.1%	1.9%	6.1%	2.2%	6.8%	0.0%	1.3%
once every three years	5.1%	0.0%	3.3%	0.0%	0.0%	0.0%	0.0%	5.0%	1.2%	0.0%	0.0%	0.0%	2.0%	2.2%	4.5%	0.0%	1.3%
less frequently than 3 years	0.7%	0.0%	0.0%	1.4%	0.0%	0.0%	0.0%	5.0%	1.2%	0.0%	0.0%	0.0%	1.0%	4.5%	0.0%	0.0%	1.3%
would not purchase certified seed	41.1%	29.4%	6.7%	47.1%	75.0%	2.8%	26.0%	30.0%	16.0%	28.0%	33.7%	15.4%	23.2%	59.0%	25.0%	72.2%	40.0%
Average quantity of certified seed a farmer would be willing to buy at a given frequency (average across all frequencies) (lbs)	4.89	4.12	5.33	2.24	2.07	36.4	43.4	52.5	35.1	54.7	39.3	45.3	66.9	26.3	46.7	21.6	38.3
Average quantity of certified seed a farmer would be willing to buy at a given frequency (excluding zero frequency) (lbs)	8.30	5.84	5.71	4.24	8.28	37.44	58.65	75.00	41.81	75.97	59.26	53.54	87.1	64.1	62.3	77.6	63.8
If easily available and affordable, how frequently farmers would purchaseapta bean seed from the source that provided BTD project seeds (% of respondents)																	
Every planting season	36.8%	24.4%	50.0%	21.2%	7.0%	55.6%	20.0%	25.0%	60.0%	32.0%	54.7%	41.9%	58.6%	19.1%	50.0%	41.8%	58.8%
once a year	39.5%	46.7%	30.8%	27.3%	39.5%	30.6%	40.0%	75.0%	29.4%	42.0%	28.4%	41.0%	31.3%	62.4%	29.5%	34.2%	26.3%
once every two years	1.3%	2.2%	3.8%	12.1%	18.6%	2.8%	0.0%	0.0%	0.0%	4.0%	2.1%	1.9%	5.1%	6.2%	6.8%	3.8%	1.3%
once every three years	0.0%	0.0%	0.0%	7.6%	2.3%	2.8%	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	2.2%	4.5%	0.0%	0.0%
less frequently than 3 years	1.3%	0.0%	0.0%	7.6%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%	1.0%	6.2%	2.3%	0.0%	0.0%
would not purchase this type of seed	21.1%	26.7%	15.4%	24.2%	32.6%	8.3%	40.0%	0.0%	8.2%	22.0%	14.7%	14.3%	4.0%	3.9%	6.8%	20.3%	13.8%
Average quantity of seed a farmer would be willing to buy at a given frequency (average across all frequencies) (lbs)	5.6	5.2	6.2	2.6	5.0	37.7	46.8	39.8	37.9	44.0	39.4	46.1	94.4	69.7	67.4	79.0	71.2
Average quantity of seed a farmer would be willing to buy at a given frequency (excluding zero frequency) (lbs)	7.0	7.1	7.4	3.5	7.4	41.1	78.0	39.8	41.3	56.4	46.2	53.7	98.3	72.5	72.4	99.1	82.5

Source: BTD Project Beneficiary Survey 2012-13

Table A23. Varietal trait preferences and potential demand for seeds of improved varieties, by Departments/Regions

	Guatemala					Honduras							Nicaragua				
	Hue-hueten	Quet-zalte	Quiche	San Marco	Toto-nicap	Atlantida	Copan	Inti-buca	Lem-pira	Ocote-peque	Santa Barbara	Yoro	Centro Norte	Centro Sur	Las Segovias	Pacifico Norte	Pacifico Sur
N =	**275**	**51**	**60**	**70**	**44**	**36**	**50**	**20**	**85**	**50**	**95**	**105**	--	--	--	--	--
Average ranking assigned to following traits on a scale of 1-10, with 1=highly preferred																	
Seed color and size	4.6	3.9	4.3	5.3	4.1	4.1	4.2	4.5	3.9	3.9	4.2	3.4	dnc	dnc	dnc	dnc	dnc
Resistance to field pests and diseases	5.4	6.1	5.1	6.4	6.1	4.8	4.3	4.2	3.2	4.5	3.8	3.9	dnc	dnc	dnc	dnc	dnc
Resistance to storage pests	6.2	6.4	5.5	6	6.3	4.3	5.1	5.3	4.4	5.0	4.7	4.6	dnc	dnc	dnc	dnc	dnc
Cooking time	4.4	3.8	4	3.4	4.2	4.9	5.6	5.7	6.5	5.3	6.0	5.0	dnc	dnc	dnc	dnc	dnc
Yield	3.6	3.6	3.2	3.1	2.8	3.6	2.5	3.0	2.7	2.1	1.9	4.1	dnc	dnc	dnc	dnc	dnc
Taste	3.1	3.2	2.4	1.4	2.3	4.7	4.8	4.6	5.7	5.1	5.7	5.6	dnc	dnc	dnc	dnc	dnc
Earliness of maturity	4.4	5.6	4.8	4.6	4.1	6.3	5.1	4.5	4.5	5.2	4.3	5.9	dnc	dnc	dnc	dnc	dnc
Marketability (Easy to sell)	7.2	6.4	6.1	6.2	7.2	5.7	5.6	6.3	6.8	6.1	6.8	6.5	dnc	dnc	dnc	dnc	dnc
Taste of green pods	6.7	5.5	6.6	4.8	4.3	6.6	7.8	7.2	7.3	7.7	7.4	6.8	dnc	dnc	dnc	dnc	dnc
Maximum amount of money a farmer is willing to pay per pound for the seed of a variety that had the preferred qualities (local currency/lbs)	5.45	6.8	5.78	5.3	5.5	12.9	8.5	14.5	15.2	11.5	13.7	10.8	dnc	dnc	dnc	dnc	dnc
Frequency at which a farmer is willing to purchase clean and high quality seed of a variety with desired traits (% of respondents)																	
1 year	71.9%	88.2%	85.0%	52.9%	52.4%	100.0%	72.0%	84.2%	98.8%	80.0%	95.8%	93.3%	dnc	dnc	dnc	dnc	dnc
2 years	15.7%	5.9%	3.3%	15.7%	26.2%	0.0%	0.0%	5.3%	1.2%	0.0%	0.0%	3.8%	dnc	dnc	dnc	dnc	dnc
3 years	7.3%	0.0%	1.7%	4.3%	4.8%	0.0%	0.0%	5.3%	0.0%	0.0%	0.0%	0.0%	dnc	dnc	dnc	dnc	dnc
4 years	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.3%	0.0%	0.0%	0.0%	0.0%	dnc	dnc	dnc	dnc	dnc
5 years	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	dnc	dnc	dnc	dnc	dnc
more than 5 years	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	dnc	dnc	dnc	dnc	dnc
Would not purchase seed (would only use saved seed)	3.3%	5.9%	10.0%	27.1%	16.7%	0.0%	28.0%	0.0%	0.0%	20.0%	4.2%	2.9%	dnc	dnc	dnc	dnc	dnc
Those that are willing to purchase seed, the quantity of seed a farmer is willing to purchase at a given frequency (lbs):	8.98	11.09	7.76	3.66	6.43	33.89	28.78	31.95	28.86	30.88	32.86	36.52	dnc	dnc	dnc	dnc	dnc

Source: BTD Project Beneficiary Survey 2012-13
dnc=data not collected