Does Technology Transfer Work? Assessing the Outcomes and Impact of the USAID-Inma Agribusiness Program

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Abstract

After years of conflict, Iraq has become unable to facilitate the development of the agricultural and business development sectors (USDA, 2010). Using the principles of technology transfer the USAID Inma Agribusiness Program (Inma) was designed to focus on agricultural development of the private sector in all 18 provinces in Iraq (USAID-Inma, 2010a; 2010b). The overall goals of Inma were to increase agricultural sales, create jobs, and assist in the adoption of new agricultural technologies. Inma invested millions of dollars in educational programs designed to strengthen the business management skills of agricultural producers and to create employment opportunities. A quantitative survey study encompassing 556 participants and a qualitative focus group study was implemented to examine the impacts of a large agricultural development effort. The study indicated participant incomes increased, farmers and business owners implemented the use of formal business plans, created stronger market linkages, new employment opportunities and sustainability. Additionally, farmers, agribusiness owners, and village elders indicated a need for additional technical and business management training programs for operating their businesses successfully.

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Introduction

After years of conflict, Iraq has become unable to facilitate the development of the agricultural and business development sectors (United States Department of Agriculture (USDA), 2010). Such strife has had a devastating effect on production in all sectors of the agricultural industry. According to the Food and Agriculture Organization (FAO) (FAO, 2008) the role for agriculture is to build a proper environment that increases agricultural production, improve food security, and strengthen agricultural services while improving rural areas of Iraq.

The United States Agency for International Development (USAID) Inma Agribusiness Program was designed to focus on the development of the private sector in all 18 provinces in Iraq. A key component of the program was the creation of fully-integrated value chains and educational programs designed to strengthen production and management skills of local farmers (USAID-Inma, 2010-2011a). The primary focus of the project was to teach beneficiaries how to use new technology, analyze financial and market information for business decisions, and identify and pursue profitable agricultural opportunities.

The program provided opportunities through the establishment of quality technical assistance; quick impact activities; attention to infrastructure; assistance to private sector entities via associations, entrepreneurs, businesses; and partnering with Provincial Development Councils, Provincial Reconstruction Teams, (PRTs) and community elders (USAID-Inma, 2010-2011b). Technical assistance provides a practical way to create knowledge transfer and increases incomes of producers (Kock, Harder & Saisi, 2010; Swanson & Rajalahti, 2010). USAID (2007) and the United States Department of State (USDOS, 2010) indicate the agriculture sector continues to play an extremely important role in the economic and social development in the country, and is one of the largest sectors for employment. The Inma program began in June 2007 and since inception has responded to multiple needs of USAID, the United States Government (USG), the U.S. Department of Defense (DOD), Iraqi farmers, and related strategic goals in Iraq. Such needs included DOD counter-insurgency activities as points of intervention which could increase production of domestic agriculture in the country.

Conceptual Framework

The foundation of the USAID-Inma Agribusiness Program was built on the framework of technology transfer, via classroom instruction, Farmer-Field-Schools (FFS), and extension field work. Technology transfer is well established in agriculture; Seaman Knapp promoted the concept of technology transfer in the early 1900s. Knapp applied research (technology) to solve practical problems. Rogers (2003) indicated the most successful model for securing the adoption or transfer of new technologies is the agricultural extension service. Bozeman (2000) stated technology transfer is “the movement of know-how, technical knowledge, or technology from one organizational setting to another” (p. 629). This was the major overall objective of the USAID-Inma Agribusiness Program, to enhance the agricultural sector in Iraq through the use of new technology (USAID-Inma Agribusiness Program, 2010a).

Rogers (2003) indicated the relative advantage of a new technology enhances the adoption. If farmers can see an advantage of the technology there is a greater likelihood for adoption. Hafer (2010) opined Maslow’s (year) Hierarchy of Need is fundamentally universal yet very poignant in grounding and facilitating the awareness for basic human
needs; especially in dire, post conflict communities. In addition, Hafer (2010) postulated Roger’s Diffusion of Innovation Theory serves as a beacon to help guide the effective practice and effective use of opinion leaders and their application in gaining and guiding popular opinion. Such applications are paramount in helping provide conflicted communities with newer, more efficient, and productive agronomic efforts and practices via awareness and guided opinion.

Erbaugh, Donnermeyer, Amujal and Kidoido (2010) avowed inadequate methods of technology transfer have limited effect on dissemination and adoption of new agricultural and business management technologies. Erbaugh et al. (2010) also suggested proper methods such as the Farmer-Field-Schools (FFS) enhance the adoption of new technologies. The research conducted by Erbaugh et al. was supported by Rogers (2003), who indicated trialability of a new technology is positively related to the rate of adoption. FFS programs developed with cooperating farmers provided other producers the opportunity to see firsthand what the new technology offered. This training program allowed farmers the opportunity to learn through group observation, an aspect of social learning and important component of adoption. Additional work in Afghanistan conducted by the Citizens Network for Foreign Affairs (CNFA) found the adoption of underground potato storage increased in rural areas as farmers experienced the economic advantage of storing produce for a few months after harvest before reaching the market (CNFA, 2007).

These findings are supported by Rogers (2003), in that the innovation (technology) needs to produce a relative advantage, either economically or socially, for the adoption of the new technology. Rogers also indicated many small-scale farmers in developing countries put greater value on social approval and less on financial return. However, Miller and Cox (2006) opined the adoption of new technology is often the key to a profitable farming operation.

**Purpose and Objectives**

The purpose and objectives of this research were approved by the USAID Contracts Officer, the Contract Officer’s Technical Representative overseeing the Inma program, the Chief of Party, and the Deputy Chief of Party who managed the project. The study was designed to evaluate the activities/farmer assistance of the USAID-Inma program to allow the management team of the USAID-Inma Agribusiness and funding agency officials to understand how farmers (direct beneficiaries) and community members (indirect beneficiaries) viewed past assistance provided by the Inma program as well as the adoption of related technologies.

Over the course of the first three years, evaluations were conducted regarding the operations aspect (fiscal and personnel) of the project, but not on the programmatic field activities. Those earlier evaluations warranted the management team and USAID to evaluate the programmatic aspect of the project. The USAID-Inma program invested millions of dollars in the development of Iraqi agribusiness through horticulture and livestock producer grants and training programs designed to enhance production and business management. These activities were designed to strengthen the ability of producers and businesses to create employment opportunities in Iraq. Therefore, the funding agency and project management wanted to measure if past activities reached the Performance and Monitoring Plan (PMP) indicators for the project.
Methodology

This study employed a telecommunication pre/post survey investigating specific program indicators, as requested by the project funding agency, USAID. The program indicators sought to increase sales, create jobs, and increase adoption of new technologies. Two populations were used for the collection of data. Recipients of Inma aid (direct beneficiaries) and a purposive sample of village elders (indirect beneficiaries) in three locations (southern, central and northern Iraq) where Inma concentrated work efforts were included in this study. The data collection instruments were designed to be self-coding; however they were read to each recipient via cellular telephone conversations. Descriptive statistics were utilized to determine if the outcome and impact indicators were reached in the project. To achieve the research objectives the researchers designed three instruments: (a) a pre-post agribusiness (reflective analysis) instrument containing a four-point summated scale, (b) a five-point summated scale instrument assessing the training programs of each of the value chains (livestock, horticulture and business development), and (c) a fifteen question instrument for focus group data collection.

Design

The methodology used for this study was a survey research design (Shavelson, 1996). To address the lack of physical addresses for recipients, minimize survey expense issues, and maximize a short timeframe for data collection, the instruments were designed for telecommunications use. The purpose of the descriptive comparative analysis was to describe and compare pre-Inma assistance data to post-Inma assistance data for direct and indirect aid recipients.

Procedures for Determining Survey Population

The population for this study consisted of 10,000 aid recipients (farmers/businesses) and three villages where prior work had been concentrated. All participants were beneficiaries of Inma aid over the last three years and were village elders (groups, 3-7 people each), residing in areas where Inma concentrated their efforts. These elders spoke on behalf of the community.

Researchers randomly selected 1,000 participants from the population of 10,000 farmers and business owners who were recipients of Inma project aid. Of those 1,000 farmers and business owners, 556 completed the pre/post-harvest questionnaires. Bartlett, Kotrlik, and Higgins (2001) indicated a sample size of 500 would be sufficient representation of the population of beneficiaries, thus allowing for generalizability to the population. The researchers attempted to ensure proportionate representations of farmers from each province were selected as study participants. For example, approximately 3,700 farmers from the Baghdad Province participated in the Inma program, representing 37% of the total participant population. Therefore, 37% of the farmers selected to participate in this study came from the Baghdad Province.

The same selection procedure was followed for each of the participating provinces. The researchers also embraced the same methodology per value chain, making sure equal representation existed for each of the training sectors. In facilitating adequate response rates with first time responders, especially those that indicated a schedule which promoted insufficient time to complete the survey, a follow-up phone call was placed to arrange a more conducive time to complete the survey.
**Instrumentation**

Instruments used for this study were designed to follow the outcome and impact indicators requested by USAID. The instruments were examined by a panel of experts consisting of USAID-Inma project management (U.S. expatriates and host country nationals), university faculty from Iraq and the United States, and USAID officials. Instruments were initially written in English and translated to Arabic, the primary language of Iraq, before being utilized with participating farmers. Due to the exorbitant cost factor, timeliness, and potential violence which made travel difficult for data collection, the research was conducted via telephone by project staff members who were fluent in both Arabic and English. According to Braunsberger, Wybenga, and Gates (2007) telephone-based surveys are viable and reliable means for collecting information. The data were analyzed by personnel employed on the Inma project who were trained in data analysis and the results were printed in English and shared with the researchers.

Using a four and five-point summated rating scale respectively, farmers were asked to complete two questionnaires regarding their current production operation and related economic conditions. Questions contained in the instruments covered such topics as: (a) I am able to track sales and profits more easily because of the new management forms; (b) before USAID-Inma assistance did you have the skills to increase production and profitability in your operation; and (c) my yields increased because of the new production practices I implemented on my farm. To qualify the data received through the surveys, the study’s facilitators conducted focus group interviews with village elders in three communities (southern, central and northern Iraq) where Inma had a concentrated work effort. The group interviews were recorded in Arabic and transcribed into English. The questions asked of the focus groups dealt with how they (elders) perceived the assistance provided to farmers: (a) are farmers sharing new technologies with others in the community; (b) do you think community members are better able to provide for the families now than before USAID-Inma assistance; (c) has the community benefited financially from USAID-Inma’s involvement in the area? These types of questions were asked with additional follow up questions.

**Content Validity**

Content validity of instruments was assured by a panel of experts (both Iraqi and U.S. expatriate or third-country nationals) familiar with the outcome and impact indicators of the Inma project and the cultural appropriateness of the Iraqi audience. Content validity indicates the answers make sense and allow the researchers to draw conclusions regarding the population being investigated (Creswell, 2005).

**Face Validity**

Face validity was addressed in the initial pilot study. It was determined the instrument needed to include both English and Arabic versions in order for individuals implementing the questionnaires to fully understand the intent of the questions.

**Instrument Development — Reliability Pilot Test**

A pilot study of the instrument was completed to establish reliability. The pilot group consisted of 20 Inma aquaculture aid recipients throughout Iraq. These recipients represented small, medium and large-scale producers. Based on feedback from those who implemented the survey, the instrument was revised to include content in both Arabic and English languages.
Reliability

The instrument reliability coefficient indicators for this study are represented in Table 1. Garson (2010) indicated an endpoint of .60 is not uncommon for exploratory research. All reported Cronbach’s alpha coefficients exceeded the .90 benchmark for meaningful internal consistency and accuracy. Research conducted by Brown (2002), George and Mallory (2003), and Gliem and Gliem (2003) indicated scores greater than .90 identifies excellent internal consistency and reliability.

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Data Collection

Data were collected from 556 respondents of the 1000 sampled during the months of November and December 2010. A response rate of 56 percent was achieved. However, 39 surveys were not complete and eliminated from the study. Five hundred seventeen of those sampled answered the reflective analysis instrument completely; moreover, only those that received specific training in horticulture \( n = 249 \), livestock \( n = 148 \), and business management \( n = 205 \) answered the individual training questionnaires pertaining to the related subjects. Additional data collection consisted of qualitative data (focus group interviews) used to triangulate the quantitative data. Three focus group \( (3 – 7 \) people in each group) interviews were conducted with village elders where Inma had a prior concentrated effort of work. These elders were nonelected officials who represented the communities/villages.

Data Analysis

Microsoft Excel was used to analyze the descriptive data, allowing researchers to compare pre- and post-Inma data results. Descriptive statistics were utilized to determine the percentage of recipients regarding the outcomes and impact indicators desired by USAID. The results from the focus groups interviews (discussions with elders) were categorized into themes and included in the research. According to Stake (1995), using data gathered from multiple sources constitutes triangulation; it increases the truthfulness of the findings.

Findings

Base-line (Reflective Analysis) Data

USAID-Inma assistance was beneficial for recipients; it increased incomes. According to the data about 52% of yearly incomes increased from 5,000 USD or below to 5,000-7,000 USD, while 20% indicated their incomes increased to above 10,000 USD after assistance from USAID-Inma (see Figure 1). It was also evident participants were using business plans; 60% of those sampled indicated the use of a formal business plan upon receiving assistance from USAID-Inma, whereas prior
to assistance, 70% reported not utilizing a business plan.

![Figure 1. Family income before and after Inma assistance.](image)

Data derived from the study indicated support from USAID-Inma assisted recipients in forming stronger ties to both input and output market linkages. Sixty-three percent of those sampled indicated stronger linkages to both input and output markets. More recipients invested personal income in their operation after assistance from USAID-Inma. Data indicated 48% of respondents invested over 25,000 USD in their operations. As for skills needed to increase yields and profitability, 62% of those sampled indicated they now possessed the skills to increase both yields and profits.

Data also revealed positive changes in the number of employees per recipient; before USAID-Inma assistance, 65% indicated they employed between 0-5 employees, whereas after assistance, data indicated more farmers employed 6-10 employees. Moreover, there was a mild positive change in number of farmers who employed 11-15 people and 16 people or more, indicating more recipients increased their employee numbers upon receiving aid from the USAID-Inma program. Producers also employed approximately 50% of their staff in fulltime positions, as compared to before USAID-Inma assistance when less than 45% were employed fulltime. Before assistance, an overwhelming number (98%) of producers indicated a need for technical and business management assistance in operating their businesses.

To create a clearer picture of the number of people affected by the assistance, the Inma program sought to inquire about family. When asked how assistance from USAID-Inma benefited families, 28% of respondents indicated a stronger community image while 70% indicated an increase in family yearly income as a result of assistance. Data also revealed the average size household for respondents was 6-10 people and their children were enrolled in school. Before assistance from USAID-Inma, less than 20% of the respondents reported consuming any meat protein during the week, yet after receiving assistance, 82% reported consuming meat at least three times per week. When asked about the sustainability of their operations, over 50% of respondents suggested they perceived their businesses were sustainable for the next five years, while 45% indicated six years or more of sustainability.

The study also investigated the value of USAID-Inma programs in communities. Those sampled indicated they agreed or strongly agreed USAID-Inma aid was beneficial to their communities. Lastly, to
understand the progression of the program and the timeframe beneficiaries had the use of the new technologies, researchers postulated it would be useful to understand when the recipients received assistance. Data indicated a large portion of those sampled received assistance during the 2010 calendar year.

Livestock Training Data
Data derived from the study indicated the majority (95%) of the respondents who attended livestock trainings either agreed or strongly agreed the trainings were valuable, and applied the new technologies they were taught to their operation. The majority of those sampled also indicated the cultural identity of those providing the training had no impact on the training. Data indicated 90% of those sampled agreed or strongly agreed the production methods taught in class were useful for solving production problems. When asked, respondents indicated feeds and feeding methods were the most valuable, followed by animal health and production methods. Forty-six percent of respondents strongly agreed they worked fewer hours upon applying the new methods. Data also indicated 59% of those sampled strongly agreed their livestock grew faster and were healthier upon applying the new production practices. Respondents were not willing. Lastly, slightly more than half (52%) strongly agreed, 41% agreed, 5% were neutral, and 2% disagreed USAID-Inma technologies were helpful to their operations. Data also exposed the largest percentage of livestock trainings were conducted during the 2009 calendar year.

Horticulture Training Data
The Horticulture sector contained multiple aspects including irrigation, open field, and greenhouse production. For reporting purposes in this study these areas were combined. Data revealed 45% of the respondents agreed training was valuable, while 43% indicated they strongly agreed. Data also indicated 6% were neutral and 6% disagreed with the statement trainings were valuable to them.

Findings indicated 50% of respondents received or built tools/implements needed for production agriculture following USAID-Inma assistance and the remainder did not. As for applying new crop production methods, 51% of the respondents agreed, 35% strongly agreed, and 14% indicated they were neutral to applying the new methods taught in classes. The respondents were neutral regarding if the cultural identity of those providing their trainings was important. When asked the usefulness of new production methods, an astounding percentage (96%) indicated they agreed or strongly agreed the methods were useful, while 4% indicated neutral. Regarding the most important aspects of the horticulture training program, greenhouse trainees indicated business management, open-field recipients indicated crop production methods, and irrigation training recipients stated irrigation applications.

Data also indicated 85% of respondents perceived working fewer hours after applying new technologies, and
increased individual yields by applying new methods. Of those sampled, 85% also believed their incomes would increase while 15% indicated a neutral position through the application of new production methods. When asked about the willingness to diffuse the new technology, over half (78%) of respondents either agreed or strongly agreed. However, 13% did not plan to disseminate the information, while 8% remained neutral. Data also showed 90% of the sample indicated that USAID-Inma technologies and staff were very helpful during their growing season and the remainder of respondents was either neutral or disagreed. The majority of horticulture activities were conducted during the 2010 calendar year.

**Business Development Training Data**

Data from the sample indicated the majority (55%) of respondents hired more staff after receiving assistance from USAID-Inma and 40% plan to in the future. Of the participants in this group, 85% agreed or strongly agreed the training they received as valuable, 10% indicated neutral, and 5% disagreed. As for applying the new methods taught in class, 79% either agreed or strongly agreed they applied the methods they were taught in the training sessions, 15% remained neutral, 4% disagreed, and 2% strongly disagreed. The respondents agreed the nationality of trainers was not important and the majority of respondents also perceived the courses were useful for solving problems in their businesses. Of those sampled 40% perceived that understanding business administration was the most important aspect of the training courses, while 2% said financial, 10% sales, and 40% indicated other.

The majority of respondents (62%) indicated their businesses became more efficient through the application of new techniques, 34% were neutral, and 4% either disagreed or strongly disagreed. As for whether new management forms they received through the trainings made tracking sales and profits easier, 59% either agreed or strongly agreed, 35% indicated neutral and 6% either disagreed or strongly disagreed. Over three quarters of those queried (78%) either agreed or strongly agreed to share new technology with others, while 17% indicated neutral, and 5% either disagreed or strongly disagreed. Data indicated over half (57%) of respondents agreed and 25% strongly agreed USAID-Inma staff and technologies were helpful, while 12% indicated neutral, and 6% either disagreed or strongly disagreed. A strong majority (93%) of respondents indicated more business trainings were needed in the coming years.

**Focus Group Interviews Data**

Three focus group interviews were conducted in different villages (southern, central, and northern geographic areas) throughout Iraq; these locations represented areas where USAID-Inma concentrated aid programs with area farmers/businesses. Results from the Village Elders or Kabir Al Kria interviews (Indirect Beneficiaries) concluded farmers were increasing their yields, applying the new methods, diffusing new technologies, and spending more disposable income in the villages. During open discussion about perceived benefits for the villages, one focus group participant in the central Iraq stated “It’s not about just finance; it is about the experience because knowledge and the new agricultural techniques represents the real value behind USAID-Inma’s support.” A common theme of the focus group interviews was the application of new technologies provided by USAID-Inma experts. Elders in all three locations perceived a continual need for these services and additional help in the areas of mechanized agriculture.

A continual theme expressed by the elders in southern Iraq was that they were
seeing positive indicators of the assistance received from USAID-Inma. Village elders stated “150 more people became employed in the community, including young people, who were not employed prior to Inma assistance.” When asked about community plans, elders indicated they were planning for added capacity in their agriculture system, but foresaw other needs that must first be addressed. The elders from the northern group indicated a strong need for machinery rental agencies where farmers and villagers could rent the needed equipment and buy supplies in order to enhance their livelihoods while increasing the incomes of their communities. Elders from all three locations opined a brighter future for their communities and agriculture plays a very large role.

Conclusions and Recommendations

The USAID-Inma Agribusiness Program had a positive impact in Iraq. During the first three and half years, USAID-Inma programs helped farmers and businesses increase yields and incomes, and offered new methods for operating their livelihoods via business development, horticulture and livestock production training programs. The results of this study showcase the outcomes and impacts of the project. However, there were a small percentage of respondents who remained neutral or disagreed on the benefit of some activities implemented during that time period. A few of the respondents from the livestock sector indicated new technologies did not produce faster growing and healthier animals, while some of the horticulture recipients did not believe the trainings were valuable, and the business training recipients indicated less willingness to adopt and share new technologies.

Overall, the USAID-Inma program assistance was beneficial for recipients to increase incomes; larger numbers of those respondents surveyed increased their yearly incomes from less than 5,000 USD to 5,000 - 7,000 USD per year, while some expressed that they increased their incomes beyond 10,000 USD per year. More business owners and farmers were beginning to use and understand the value of formal business plans. Over 55% of the respondents indicated they now use formal plans in their operations, whereas before assistance less than half used them. Stronger ties to markets were evident; both data sources revealed producers now have stronger connections to input and output markets. Of those sampled, 63% indicated stronger linkages to both input and output markets.

The majority of farmers in the study indicated they shared or are willing to share new technologies with others. This finding is supported by research conducted by Miller and Cox (2006), who found farmers created positive interaction with other producers and gain satisfaction by sharing new technologies and experiences. Rogers (2003) indicated potential adopters ask for guidance from early adopters, as they are the catalyst for adoption. However, in the three areas of assistance (livestock, horticulture and business), livestock respondents were less willing to diffuse new technologies to others; only 55% of the respondents indicated they have or are willing.

The value of the USAID-Inma program was evident through the investment farmers and businesses made using their own money, 48% indicated they invested over 25,000 USD which is a substantial amount in rural Iraq. An overwhelming majority, 62% of those sampled, indicated they now had the skills needed to increase their yields and profits. This was supported by the USAID-Inma Work Plan (2010a) which suggested more farmers agreed that after attending trainings, they acquired the knowledge to increase yields and incomes. Farmers in the livestock sector also
concurred with the statement, leading the researchers to deduce programs actually taught by USAID-Inma experts likely were a benefit to the end user. Erbaugh et al. (2010) found proper teaching methods increase use of technology.

Both businesses and farmers employed more people after receiving assistance, assuring USAID-Inma has reached at least one of the outcome targets, which was to increase employment opportunities for Iraqis. Before USAID-Inma assistance, 65% indicated they employed between 0-5 employees, however after assistance, a majority indicated they employed six or more people. This finding was supported by qualitative data. One group of village elders indicated 150 people are now employed in their village who were not employed before Inma assistance. More recipients increased their employee numbers after receiving aid from the USAID-Inma program. Moreover, recipients of aid requested additional training. Almost all (98%) of respondents indicated they favor continued technical and business management assistance in operating their businesses. Beneficiaries of USAID-Inma aid agreed or strongly agreed the training they received was valuable to them. A surprising result of this study reflected how assistance benefited their families; 28% indicated their community image increased while 70% indicated an increase in income as a result of assistance.

Data suggested the average size family ranged from 6 to 10 people, increasing the multiplier effect of the Inma program. However, increase in income did not result in recipients sending their children to school. Ninety-five percent of the respondents’ children were already enrolled in school. A startling finding of this study dealt with meat protein consumption. Before assistance from USAID-Inma, less than 20% of respondents consumed any meat during the week, yet after receiving assistance 82% consumed meat at least three times per week. According to research by FAO (1992), meat consumption increases as incomes rise. As families’ disposable incomes increase their eating patterns change (USDA 2008). This could have indicated that USAID-Inma programs created not only outcomes but impact in Iraq. This is an indirect positive indicator of change. Farmers also perceived their operations were sustainable; over 50% suggested their businesses were sustainable for the next five years, while 45% indicated six years or more of sustainability. Again, the authors point out not all recipients indicated they benefited from all Inma technical assistance activities.

The study also investigated the value of USAID-Inma programs on the communities. Of those sampled the majority indicated they agreed or strongly agreed that USAID-Inma aid was beneficial to their communities. Those findings were supported by qualitative data derived during the focus group discussions with Village Elders. Community elders overwhelmingly stated that USAID-Inma assistance was having a positive impact on their communities. According to Fuhrman and Rohs (2011), focus groups are a viable way to collect qualitative data about people’s opinions and perceptions on a variety of topics.

Lastly, to understand the progression of the program researchers postulated it would be a benefit to understand when recipients receive assistance. Livestock sector beneficiaries received the majority of assistance from USAID-Inma during the 2009 calendar year, while business development and horticulture were provided more assistance in 2010. During the first two years of the project (2007 & 2008), limited activities were implemented because of the increased violence during the U.S. military
push to stop the insurgents. It leads the researchers to speculate, had the beneficiaries received assistance earlier in the project, would the researchers have found even greater adoption of technology or technology abandonment?

**Implications**

Research indicated agricultural development programs that combine aid inputs (seed/feed/equipment etc.) and technical training for producers may lead to positive outcomes and possibility of a greater potential for sustainable impacts. Many farmers in developing countries cannot afford or implement many of the new technologies available, yet, may adopt them if they are taught how the technologies work and the possible benefits. The researchers suggest a follow up assessment of Iraqi agriculture be implemented in three to five years to measure the long-term benefits of the new technologies. According to Kock, Lamm, and Turnbull (2012), when development projects conclude the long-term success becomes the responsibility of the beneficiaries. Only time will tell if the transfer of technology throughout the agricultural sector in Iraq will benefit future generations, the next generation of farmers are still in school.

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