

Full Length Research Paper

Qualitative and quantitative approaches to study adoption of sustainable agricultural practices: A research-note on mixed method approach

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The emerging field of mixed methods research is yet to develop a unified framework of procedures for mixed methods data analysis (Greene, 2008). Since the last few decades, the efforts of explaining social aspects within agricultural research have gained importance, but in evaluating agricultural technology adoption and their impacts, the use of combined methods is even more infrequent. This study provides a research note to describe the processes and outcomes of engaging in mixed data analysis. The study was conducted in selected regions of Pakistan and China to evaluate the adoption and non-adoption of sustainable agricultural practices among the smallholders in both countries. The proposed method was predominantly helpful in reviewing the hypotheses, assistance in designing questionnaires, and planning of survey operations. This study also suggests that mixed methods researchers should consider how qualitative and quantitative methods effect integrated data analysis approaches, inquiry-based analyses of qualitative and quantitative data which cover the multiple views, or rational models, of the investigators involved in the study.

Keywords: Agricultural sustainability, survey design, mixed methodology, agrarian questionnaire, smallholder, agricultural extension.

INTRODUCTION

Despite advances, much of the studies have limited efficacy because of heavy dependence on quantitative methods alone. Whereas surveys provide critical data on whether or not variations have occurred as a result of a program introduced, qualitative methods classify the underlying explanations that why we do or do not observe these variations (Adato, 2011). The integrated use of both qualitative and quantitative methods is not very traditional and often used, though growing, practice. In evaluating agricultural technologies adoption and their impacts, the use of combined methods is even more

infrequent (Place *et al.*, 2007). Agricultural systems are formed by related ecological and social subsystems (Conway, 1987), and their association can be portrayed through element input forms, which thus decide the agricultural sustainability (Park and Seaton, 1996). They collectively work for an integrated purpose by producing agricultural products in a sustainable way. In a social system, human beings act as principal and relevant actors within an agricultural system (Matthews and Selman, 2006; Karami and Keshavarz, 2010) and indirectly their decisions (while adopting new agriculture technology) are influenced by the acts they made (Sundkvist *et al.*, 2005). By attaining social and ecological feedback to the humans, an increase in sustainability can be achieved (Lewis *et al.*, 1997). In the past two decades,

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Table 1. Issues considered in quantitative and qualitative studies.

Qualitative	Quantitative
Political and Institutional dynamic forces like, interdepartmental cooperation, conflicts, and investment	Impacts on production, income, Employment, education, expenditures, health and nutrition
Beliefs and attitudes, norms and values, social relationships	Targeting accuracy
Gender relations and status of women	Participation rates in training or services
Experiences with different institutions like, government agencies, hospitals, and banks	Household socio- demographic profile
Processes occurring in households, Organizations, and Communities	Household's decision making
Service delivery like care practices and attitudes of service providers toward beneficiaries	Quality of services like staff absence, waiting times, availability and accuracy of consignments
Local satisfaction with program design, targeting, and administration	Test scores

hundreds of adoption studies have been reviewed (Pattanayak *et al.*, 2003; Mercer, 2004; Knowler and Bradshaw, 2007) which show that efforts to explain social phenomena within agricultural research have gained significance. Such kind of research demands an in-depth understanding of farmer's behavior about the uneven socio-economic factors, institutional features, perceptions and informational factors, resource endowments, and psychological factors. These understandings can be gained through qualitative and quantitative methods.

Qualitative survey methods started to get importance in developmental projects during the 1980s, primarily in reaction to the shortcomings of questionnaire-type surveys, which were considered time-consuming, expensive, and not suitable for providing a deep understanding of an issue (Pretty *et al.*, 1995). On the other hand, over dependency on quantitative methods alone results in the limited utility of the data.

Collectively, quantitative and qualitative approaches provide more comprehensible, reliable, and useful conclusions than do individually (Adato, 2011). This research note pinpoints key elements of good mixed-method design in a study conducted on adoption of sustainable agricultural practices among smallholder agroecosystem of Pakistan and China, with the aim of resulting in more efficient agrarian surveys. Mixed-methods research is taken as an analysis method that utilizes both qualitative and quantitative methods in a single study. Issues considered in qualitative and quantitative survey studies are discussed in the table (1). Recent discussions about mixed methods research have directed some researchers to affirm mixed methods research as the "third methodological movement" (Teddlie and Tashakkori, 2003), and, of course, as a

viable research pattern in its particular right (Johnson and Onwuegbuzie, 2004). A little attention has been observed in mixed-method literature on the analysis and the interpretation of results focusing these methodologies (Bryman, 2007), neither has this literature formed a unified set of guidelines for procedures for the mixed-methods data analysis (Greene, 2008).

The dearth of literature has impelled prominent mixed methods researchers, to inspire for more inquiries into the ways under which the mixed-method studies include qualitative and quantitative data (Bryman, 2006, 2007; Johnson *et al.*, 2007). So, the mixed-method approaches are necessary, because whether development programs work as they intend depends not only on how efficiently resources and knowledge are transferred, but also on complex economic and social dynamics in households, communities, and institutions (Adato, 2011). By our recent experience in Pakistan and China, we also noted that mixed-method approach can yield insights that contribute to an effective agrarian survey. This research note can serve as a reference guide in the application of qualitative and quantitative methods to researchers who are interested in explaining social phenomena within agricultural settings.

Key issues in mixed-method approach

Sequencing of methods

Despite the fact that sequencing should be possible in the different ways, a best practice assessment outline may start with qualitative methods to recognize the key

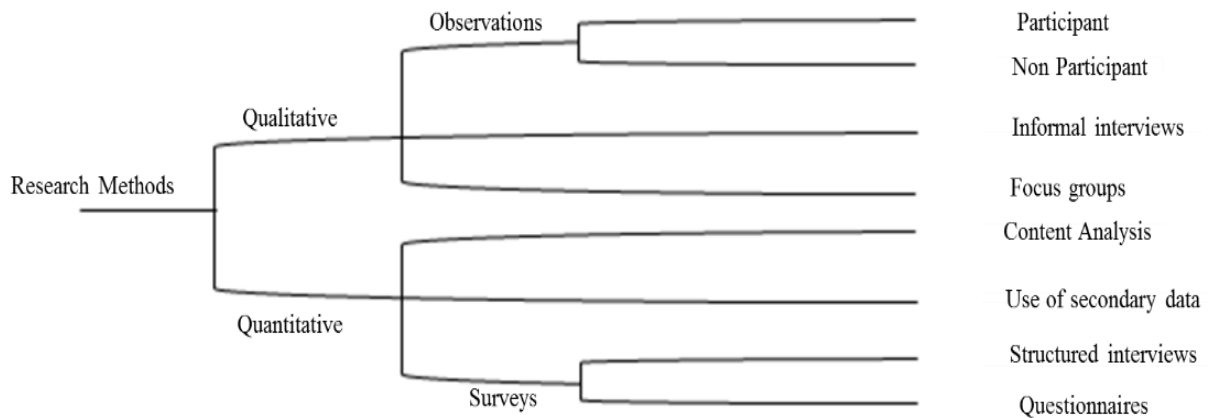


Fig. 1 Sequence of qualitative and quantitative methods used in the study

issues, and accumulate data to educate survey plan followed by the baseline survey. The survey's data are utilized to outline and to select the specimen for another phase of qualitative research and to distinguish issues for examination, for example, studies that require explanation. Depending on the research design, needs, and resources, additional rounds may follow. A subset of quantitative indicators and qualitative data can be collected at regular intervals, maintaining common indicators but also adapting indicators based on new findings. Many projects invest substantial resources in monitoring the adoption of sustainable agricultural practices (SAP) that collect large quantities of data which reflect expected outputs without explaining the reasons for good or poor performance, and the adoption rates, which limits the ability to respond. The complimentary use of qualitative methods in agricultural monitoring systems can help to deliver these explanations and classify unsuspected issues and outcomes.

Site and household selection

In Some qualitative studies, an appropriate sample of households or locations is included; a thorough investigation methodology utilizes survey information to stratify qualitative samples. The qualitative samples would then imitate characteristics of the quantitative sample. Inside these stratified classes, households or people are frequently chosen purposively, to assure consideration of households overall the distribution. In the case of random sampling, a large sample should be selected, comprising all ethnic groups, gender, financial conditions, technology/ SAPs adopters or non-adopters and education level, to cover across the distribution (Place *et al.*, 2007).

Data analysis and integration

Numerous studies, that gather quantitative and qualitative information, fail to check the effect of their synergies. For instance, information from rotating rounds of surveys and qualitative studies are not usually used to educate the inquiries for the alternating further round. By the failure of integrating, the data at the final stage of analysis cause losing of analytical power of mixed designs because much of studies are analyzed and reported separately due to short of time (Adato, 2011). So, the resources and time for data integration are also the critical issue to consider in the project.

QUALITATIVE AND QUANTITATIVE METHODS FOR AGRARIAN SURVEY

Mixed Method Approach

In this exploratory study, the qualitative and quantitative methods used are shown in Figure(1). Focus groups were organized in both China and Pakistan for the following enlisted discussion topics, (1) sustainable agricultural practices, (2) farmer's behavior, (3) financial factors, (4) social factors, (5) climatic factors, (6) farmer's perceptions, (7) farmer's beliefs, (8) farmer's attitudes, and (9) barriers to adoption. The discussion was kept free-flowing within each discussion topic and the time was proposed as a critical constraint for obtaining in-depth understandings. Therefore, to achieve the critical information, some discussion points (sustainable agricultural practices, farmer perceptions, behaviors, and barriers to adoption) were prioritized. Others were backed up with open-ended questions, which could be filled out

Table 2. Detailed view of the methods used for data collection.

Data collected on	Methods
Farmers livelihoods	Questionnaire, Farmers interview, field walk
Problems faced by farmers	Literature review, Focus groups, problem ranking PRA exercise
Documented sustainable agricultural practices and traditional farming practices	Interviews with Govt. agricultural offices, NGO's staff,
Reasons of adoption and non- adoption of sustainable agricultural practices	Questionnaire, Farmers interviews, informal talking with farmers and key informants
Rainfall and temperature data	Local Govt. meteorology department
Maps generated	GPS, GIS

Table 3. Categorization of Farmers' responses for adoption/non-adoption of sustainable agricultural practices.

Categories	Factors
work load	work load, health /age, lack of labor, lack of equipment, Migration, Weeding, Complicated
Costs	cost for herbicide, cost for fertilizer, cost for labor, low investment capacity, land size, market system,
Yield/benefits	grant dependency, low yield increase, end of subsidies, conflicting requirements
Traditions	traditional farming, habit, land tenure system
Behavior	Lazy, Mistrust, culture in community

by each of the participants. All these materials were initially, recognizing their multilingual culture, written in the native languages of both countries by a native speaker who had received formal agricultural education and then they were translated into the English language.

Participant recruitment and implementation

Smallholder farmers are the actors in the adoption of SAPs. The World Bank defined the smallholders as those with a small asset base, operating less than 2 hectares (ha) of land (Csaki and de Haan, 2003). So in this study, the farmers in the regions of both China and Pakistan having less than two hectares of land were considered as smallholder, and they were selected randomly to get data through detailed questionnaires. Informal interviews which were designed for both countries keeping in view their field situation and conclusions from the focus groups. In China, Fujian province was taken as a case study and at least 25 farmers were selected from each part (Fuzhou, Zhangzhou, Nanping, Longyan, and Sanming) of this province. While in Pakistan, two districts (Rawalpindi and Chakwal) from Punjab province were selected as the case study, and one farmer from each Union Council was chosen for data collection. The detail of the methods, used for data collection, is indicated in the table (2). Several tools were used for the data triangulation and elimination of biases (Mikkelsen, 2005). One of the prominent challenges in focus groups was the medium of communication in both countries. To handle the problem of local languages, local students studying

agriculture and with a diverse cultural background were appointed as the translator, communicator, and moderator. At the same time, explanatory notes were noted down by the rapporteur. At the start, much of the time was spent in discussing SAPs. The farmers, due to hesitation, lack of education and information, faced difficulty in understanding the technical agricultural terminology. From discussion conducted in the focus groups, two comprehensive questionnaires were designed keeping in view the smallholder's agricultural scenario and goals of the study in both countries. For each location, GPS coordinates were recorded to generate different maps of the area. After interviews, small gifts were presented to the farmers for their encouragement and interests.

DATA ANALYSIS

All transcripts were uniformly translated into English and saved as text files, and followed by content analysis. In this process, coding attaches a theme to the meaning of statements. Through the rapporteur's notes and reviews that followed, themes were created according to their appearance within individual topics and locations. A grounded theory based iterative process of analyzing data was used (Bryman and Burgess, 2002), with coding, categorizing and conceptualizing of data and constant comparisons with raw data. Firstly, quantitative data collected through questionnaires was centralized in Excel sheets and validated with follow-up interviews. The qualitative data were encoded in SPSS, and analyzed with

SPSS Inc. 17.0 (George, 2011). Data regarding reasons for adoption/non-adoption of sustainable agricultural practices will be recorded according to the categories presented in Table(3).

FINDINGS

The findings from this study did not reaffirm only the output of qualitative and quantitative data analysis but also unified other lessons learned from the mixed-method approach. The consideration is of particular importance if mixed-method design findings are applied for conducting effective surveys in agricultural studies. Moreover, a modification is also suggested the usefulness of information for the proposed access, to inform about smallholder's decision and perceived consequences. As such, we were able to make two significant improvements in our framework according to the local field conditions in both countries. Secondly, simple and local terms were collected for questionnaires-design because most of the smallholders had received primary education, such simplicity proved to be helpful in getting better responses and more efficient feedbacks. Thirdly, the complications faced in the mixed methods helped to foresee possible hurdles and strategies to cope those in future surveys. The findings were compiled and presented to research peers. The presentation received detailed comments, which were useful for the writing activities.

RESEARCH IMPLICATIONS

The techniques on mixed-method design have the flexibility to support social research designs within agriculture with the option of modification according to research topic and framework. In addition to providing insights on questionnaire-design and survey-operations, it adds values to the guiding research framework. Given these credits, it can be extended to other agricultural investigations; including climate change adaptation, program participation, and response to agricultural policies. Future studies should address their contribution to an effective agrarian survey.

CONCLUSIONS

Governments and international agencies commonly use mixed-method approaches in different monitoring and evaluation projects. The high cost of survey-based research and time limitations are some of the causes that encourage finding single-method approaches deliberately. The research interest, towards the advancement of the understanding of social phenomena about agricultural sustainability, is increasing with the passage of time. Many of these investigations entail

primary data from the farm level, particularly on smallholder's behavior. The combination of qualitative and quantitative methods offers valuable insights and considerations towards the design of effective agrarian surveys. At the outset, agricultural researchers must be aware of the cultural peculiarities of social background. Other procedures involved in the mixed method can be simplified in designing focus group, participant recruitment for data collection and implementation, data analysis, and findings. In their application, these procedures should be improved according to individual research topics and frameworks. If both quantitative and qualitative researches are undertaken with care, then mixed-method will result in a better understanding of adoption and non-adoption of sustainable agricultural practices than either approach alone.

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CONFLICT OF INTERESTS

The authors have NO conflicting financial or non-financial interests in the subject matter or materials discussed in this manuscript.

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