Adoption of improved *tef* and wheat production technologies in crop-livestock mixed systems in northern and western Shewa zones of Ethiopia

by

Hailu Beyene Abera

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DEDICATION

This work is dedicated to my late brother Bogale Gebtre Egziabher who made every effort to encourage me pursue my post-graduate studies valuing the opportunity he was not fortunate to have and my late niece Fasika Bogale for her unforgettable cares for me. They were eager to see me complete my study unfortunately they passed away during my study program which made my grief for their loss unbearable.
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Degree: PhD
Department: Agricultural Economics, Extension and Rural Development
Promoter Professor Rashid M. Hassan

Abstract

Since adoption is a dynamic process that involves learning about new technologies, static adoption models fail to adequately explore the effects of changes in farmers’ perception and attitudes over time. This study analyzed the influences of farmers’ learning and risk on the likelihood and intensity of adoption of improved *tef* and wheat technologies in Northern and Western Shewa zones of Ethiopia. The study employed Xtprob and Xttobit and random effect models and panel data of the same farmers from 1997 to 2001. Separate samples were selected for wheat and *tef* and the study covers the same farmers from 1997-2001. Panel data are better suited to study dynamic changes and the random effect models control for unobserved variability and potential endogeneity.

Comparison of the main features of *tef* and wheat farmers revealed that wheat farmers are slightly younger, more educated, have slightly higher family size and significantly higher family labour than *tef* farmers. While average farm size is similar for *tef* and wheat farmers, farmers cultivated 60% and 30% of their land to *tef* and wheat, respectively. However, *tef* farmers allocated only 20% of their *tef* area to improved varieties due to shortage of desirable varieties whereas wheat farmers allocated 90% of their land to improved varieties from 1997 to 2001. Only three improved varieties were demonstrated and limited quantities of improved seeds were distributed to *tef* farmers whereas six improved wheat varieties were demonstrated and relatively sufficient quantities of improved seeds were distributed to wheat farmers during the study. Besides, similar
levels of fertilizers and herbicide were used on tef and wheat. Wheat and tef were mainly grown for own consumption as less than half of the produce (48% of all wheat and 46% of all tef) was sold in the market.

The study provided evidence of the importance of learning in the adoption decision and area allocation to improved varieties. As farmer’s gained more experience from growing the new varieties in previous years, they continued adoption and increased areas under these varieties. The study also revealed that adopters of wheat and tef technologies have increased their production by 20% and 39%, respectively, than non-adopters. Results of the analyses indicate that awareness, availability and profitability of the new improved tef and wheat varieties enhanced farmer’s learning and farmer’s experience had positive influence on the likelihood and intensity of improved seed adoption. Improved tef and wheat varieties were found more risky than the local varieties.

The study further revealed that younger age of farmer, farmers’ learning from previous experience, availability of family labour and credit are key determinants of the likelihood and intensity of adoption of improved seed. Policies and strategies that contribute to timely availability of improved inputs and provision of credit enhance farmers learning from their own experience on adoption. Policies and strategies that focus on farmers’ education and provision of insurance for crop failure to reduce risk would help the new extension program (NEP) achieve its objectives which give emphasis to raising smallholders’ production and productivity.
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Abbreviations and Acronyms

ADLI  Agricultural Development Led Industrialization
ADAs  Assistant Development Agents
ADD  Agricultural Development Department
ADDP  Ada Development Program
AISCO  Agricultural Input Supply Corporation
AISE  Agriculture and Input Supply Enterprise
AMC  Agricultural Marketing Corporation
ARDU  Arsi Rural Development Unit
AUA  Alemaya University of Agriculture
CADU  Chilalo Agricultural Development Unit
CBD  Coffee Berry Disease
CEEPA  Center for Environmental Economics and Policy in Africa
CSA  Central Statistics Authority
CIMMYT  International Wheat and Maize Improvement Center
DA  Development Agent
DAP  Diammonium Phosphate
EARO  Ethiopian Agricultural Research Organization
EIAR  Ethiopian Institute of Agricultural Research
ECM  Error Components Model
EMTPs  Extension Management Training Plots
ESE  Ethiopian Seed Enterprise
ESIA  Ethiopian Seed Industry Agency
FAO  Food and Agriculture Organization
FEM  Fixed Effects Model
GDP  Gross Domestic Product
ha  Hectare
HYVs  High Yielding Varieties
IAR  Institute of Agricultural Research
IFAD  International Fund for Agricultural Development
IFDC  International Fertilizer Development Center
ILO   International Labour Organization
kg    Kilograms
km    Kilometer
LR    Likelihood Ratio
ML    Maximum Likelihood
masl  Meters Above Sea Level
MCTD  Ministry of Coffee and Tea Development
MEDAC Ministry of Economic Development and Cooperation
MPP   Minimum Package Programs
MOA   Ministry of Agriculture
MSFD  Ministry of State Farm Development
mm    Millimeter
NEP   National Extension Program
NFIU  National Fertilizer Inputs Unit
NGOs  Non-Governmental Organizations
NPK   Nitrogen, Phosphorous and Potassium
OPVs  Open Pollinated Varieties
PAs   Peasant Associations
PADEP Peasant Agricultural Development Program
PCs   Producers' Cooperatives
RELC  Research and Extension Liaison Committee
REM   Random Effects Model
SCs   Service Cooperatives
SFYP  Second Five-Year Plan
SMSs  Subject-Matter Specialists
TLU   Tropical Livestock Unit
T and V Training and Visit
VIF   Variance Inflation Factor
WADU  Wolayta Agricultural Development Unit
Hailu Beyene Abera was born in Addis Ababa, Ethiopia on 20 January 1952. He obtained his first degree in Agricultural Economics in 1977 from Alemaya College of Agriculture, Ethiopia. He was employed as Assistant Research Officer in the Ethiopian Institute of Agricultural Research (EIAR) in 1978 in the Department of Socio-economics Research. In 1982, he was granted an FAO scholarship to pursue a Masters of Science in Agricultural Economics at the University of the Philippines. In 1985, he joined the EIAR and served as Research Officer until the end of 1999. He was promoted to Senior Researcher in August 2005. Mr Hailu was Division head and Department head of Socio-economic Research, project leader of Farming Systems Research, member of National task force for African Highlands Initiative and member of Research staff promotion committee. Mr Hailu has published 8 articles in proceedings and co-authored 3 articles in journals, 9 articles in books and 17 articles in different proceedings.

In 2000, he joined University of Pretoria to pursue a PhD in Agricultural Economics. The contribution of his dissertation was to add to literature that adoption is a dynamic process. The study employed a learning model and panel data set to analyze the effects of learning as a dynamic process using Xtprob and Xttobit models, which are appropriate to analyze farmer’s decisions over time. The results revealed that farmer’s learning is one of the key factors in the adoption and intensity of use of improved tef and wheat technologies and increase production.