Effect of Agricultural Education on Farmers Efficiency: A Review
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ABSTRACT:
There is general agreement that education has a positive effect on agricultural productivity. Various studies suggest that rural education increases agricultural productivity. Many farmers in rural areas do not have the most up-to-date information on how to grow food efficiently and economically. Improving their knowledge of new techniques and technologies, in addition to providing them with any physical resources necessary for implementation, can dramatically increase the farmers’ level of productivity (Rosegrant & Cline, 2003). Of course, increased productivity for a few years is not a solution if farming cannot be sustained for the next hundred years. Recognizing the need for a sustainable approach to agriculture, our solution emphasizes farmer education in methods and technologies that do not have an overly negative effect on soil, water, and air quality. Feder, Lau, and Slade (1987) showed that the Training & Visit system of agricultural extension implemented in India resulted in “a high probability of at least an acceptable rate of return to intensified extension” (685). That is, training farmers pays. Their analysis indicated that the benefits resulted in large part from an improvement in the management of the farm rather than new inputs.

Introduction:
The better educated farmer is quicker to adopt profitable new processes and products since, for him, the expected payoff from innovation is likely to be greater and the risk likely to be smaller” (Nelson and Phelps, 1966, p. 70). Concepts of education and farm efficiency through worker effect, allocative effect, and choice of production technique are well-defined in Welch (1970) and Schultz (1975). Another concept of productivity, market efficiency, is defined as a farmer’s ability to obtain the highest net sale price for his outputs and the lowest net purchase price for his inputs. Education enhances a farmer’s ability to know his alternatives, to know when and where to buy and sell. A better educated farmer is more likely to know what prices are likely to prevail in equilibrium, and can therefore become a better bar gaining. He or she may also have a finer discrimination of differences in quality and may be able to judge quality more accurately. Many existing studies find positive effects of education on the adoption of agricultural innovations by farmers. The diffusion of new agricultural technology is expected to raise their incomes and improve their nutrition. In particular, many economists have hypothesized that highly educated farmers tend to adopt productive innovations earlier than those who are relatively poorly educated.

Extension:
Scholars have attempted to define the concept of extension (Bembridge, 1990: 11; Röling, 1988: 36; Swanson & Claar, 1984: 1; Oakley & Garforth, 1985: 20; Leagans, 1971: 106), but due to its
dynamic character a single definition is not acceptable. There are three dimensions of extension which the researcher presents. The first dimension considers extension in terms of agricultural performance. Extension is viewed only in terms of improving production and profitability of farmers. The second dimension equates extension to rural community development.

Under this dimension extension is viewed as serving to advance rural communities including the improvement of their agricultural development tasks. The third dimension equates extension to comprehensive non-formal community education. Extension is viewed as a provider of non-formal agriculturally related continued education for multiple audiences such as farmers, spouses, youth rural community and urban horticulturists (Rivera, 1989: 94).

One definition of agricultural extension widely used in the FAO publications sees extension as a service or system which assists farm people, through educational procedures, in improving farming methods and techniques, increasing production efficiency and income, bettering their levels of living and lifting the social and educational standards of rural life (Swanson, 1984). The definition focuses on encouraging and involving rural people's own organizations, enhancing individual and collective self-reliance, and environmental issues. From the analysis it is clear that extension is different from rural development. The question is; what is rural development? The concept is discussed as follows:

**Agricultural Extension and Farmer Education:**

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Of course, increased productivity for a few years is not a solution if farming cannot be sustained for the next hundred years. Recognizing the need for a sustainable approach to agriculture, our solution emphasizes farmer education in methods and technologies that do not have an overly negative effect on soil, water, and air quality.

Farmer education programs will:
- increase local food availability
- increase farmer income
- increase sustainability of agricultural practices

Increasing local food availability directly addresses hunger problems that arise when food is not available for people to buy. In rural areas where connections to more productive areas are limited, people depend on food grown by farmers in their own region: if the farmers can’t grow enough food, people go hungry. Improved crop yields can both meet the demand of the region (which could be just a few villages) and lower the price of food in that region. Lower food prices mean more people can afford to buy the food, and less people go hungry.

Approximately 50% of the world’s undernourished population is made up of low-income farm households (Shaw, p.395). So, a top priority in addressing hunger problems is to decrease poverty levels among these farmers, and increase their productivity so they can feed themselves and their
families. Because the farmers are the price setters, any lowering of prices due to increased productivity should not affect them negatively. Increasing the sustainability of agricultural practices will ensure food security in years to come by preserving and rehabilitating the resources used to produce food, including soil and water.

Feder, Lau, and Slade (1987) showed that the Training & Visit system of agricultural extension implemented in India resulted in “a high probability of at least an acceptable rate of return to intensified extension” (685). That is, training farmers pays. Their analysis indicated that the benefits resulted in large part from an improvement in the management of the farm rather than new inputs. Thus, farmer education can help even without new technologies.

Improving agriculture in Africa is a clear priority for addressing the food crisis. Africa has some of the highest hunger rates as well as some of the lowest agricultural productivity rates so, we will focus on farmer education in rural African regions.

Many regions in Southeast Asia are also crippled by hunger; implementing farmer education programs in these regions is another priority. Farmer education programs will be implemented as part of the Food for Work program. In the off-season (when farmers are not growing crops), food aid will be provided to them as long as they participate in education sessions and incorporate the new technologies and methods into their farming.

As connectivity to a central location improves (part of the plan for cluster schools: see Primary Education), farmers can gather at the central location for training sessions where they also receive distributions of seed.

Curricula will be regionally-specific and include:
- which crops to grow, based on growing environment (soil, climate, water availability), nutritional value and profit
- how to implement sustainable agricultural methods that will maximize yield
- how to use mechanized farming tools

The introduction of new types of crops can improve both a farmer’s profits (since they won’t face as much competition from other local producers) and the nutrients available to those who consume what he produces. For example, introducing lettuce to a couple in Niger allowed them to grow and sell enough to support their family (Hartill, 2010).

In arid areas where crop farming is deemed unsustainable, related skills such as husbandry of grazing animals would be taught to supplement (or even eventually replace) current practices.

As Glendinning, Mahapatra, and Mitchell (2001) note in their analysis of agroforestry extension in eastern India, a “bottom-up” approach is absolutely necessary both to create an optimal regionally-specific curriculum and to ensure that farmers see the benefit of agricultural reforms. For example, the Orissa Social Forestry projected, launched in 1983 with assistance from the Swedish International Development Agency, was highly successful in promoting farm forestry in the state of Orissa, in eastern India. Government officials, village leaders, and farmers all took part in training
Group discussions were an integral part of the project; villagers themselves took part in planning and idea-generating. It’s important to recognize that such a structure is not simply humoring the locals so they will accept changes to their lifestyle; as Glendinning, Mahapatra, and Mitchell point out, “Acknowledging and learning from indigenous knowledge and traditional practices, built upon generations of observation and experience, is more likely to lead to a development programme that is sensitive and relevant to the local context” (285-286). A farmer’s personal contact with the extension agent (that is, the individual training farmers and disseminating information) directly influenced his likelihood to accept new ways of doing things. So, building relationships with the local farmers and village leaders is crucial.

The farmer education programs in conjunction with Food for Work will be funded by the NGO sources that run the Food for Work program. The training sessions at central locations will be funded and run by the government wherever possible, and by NGOs where government support is not sufficient.

The World Food Programme runs Food for Work programs, and some countries, like Bangladesh and India, run their own similar programs. These Food for Work programs can improve their effectiveness by incorporating farmer education in the manner detailed in this solution.

The large-scale effects of this solution would not be seen for a number of years, as farmers across Africa and Southeast Asia learn more and incorporate what they’ve learned into their practices. The good news is that this solution would create a sustainable knowledge base in each targeted community, and once the improved methods and technologies are incorporated, they can be passed on to future generations. (link this back to the timeline – perhaps stress that while results are slow in being produced they are very long lasting – you've done that partially in the next sentence but link the two together so it answers the header in a clearer fashion)

Farmer education programs through existing Food for Work programs can be implemented/improved within 5 years. The actual training farmers receive can be completed within a year. So, the first wave of this solution can be accomplished within a decade, with beneficial effects continuing for years to come.

Below is a graph of increased maize yields before and after the Millennium Villages Project interventions. Similar figures can be expected from this plan, since the same techniques will be applied.

Below is an example of what a farmer curriculum would look like:

**Farmer Curriculum**

**Stage 1: Farming Methods**

**Goal:**

1. To promote practices that maximize yield and minimize negative effects on environment
2. To spark interests in and introduce alternative farming methods
3. To promote sustainable agriculture

**Potential Topics:**

1. Crop rotation
2. Cover crops
3. Polyculture
4. Soil enrichment
5. Natural pest predators
6. Bio-intensive integrated pest management
7. Natural resource preserving
8. Irrigation
9. Recycling
10. Utilizing wastes
11. Aquaponics
12. Hydroponics
13. Roof top farming
14. Square foot gardening
15. Biotechnology
16. Food storing and processing

Stage 2: Career Development

Goal:
1. To expand career opportunities
2. To provides farmers with management skills
3. To prepare farmers for competitions in markets

Potential Topics:
1. Agriculture economics
2. Farm management
3. Leadership development
4. Agriculture-related career opportunities
5. Marketing

Impact of Agricultural Extension on Rural Farmer:

In its broadest sense, extension is an educational process with communication being its core component. The authors van den Ban and Hawkins (1996) define the term extension as the conscious use of communication of information to help people form sound opinions and make good decisions.

As a system, extension facilitates the access of farmers, their organizations and other market actors to knowledge, information and technologies; facilitates their interaction with partners in research, education, agribusiness, and other relevant institutions; and assists them to develop their own technical, organizational and managerial skills and practices (Christoplos, 2010).

In relation to its role in rural livelihoods, agricultural extension encompasses the entire set of organizations that support and facilitate people engaged in agricultural production to solve problems and to obtain information, skills, and technologies to improve their livelihoods and well-being (Birner et al., 2006).
Since a livelihood comprises the capabilities, assets and activities required for a means of living, it appears that agricultural extension intends not only to increase productivity and income (Anderson and Feder, 2007; Waddington et al., 2010), but also to improve multifaceted aspects of rural life. Often times, extension impacts have been associated with improvements in productivity and household income. A worldwide review of extension services shows that the impact of extension services on rural livelihoods is mixed: very high rates of return in some cases and negligible achievements in other cases (Rivera, Qamar and Crowder, 2001; Anderson and Feder, 2007). It is also widely acknowledged that estimation of extension impact on rural livelihoods is challenging in terms of dealing with attribution issues and linking cause and effect quantitatively (Anderson and Feder, 2007).

**Interpretative Review:**
Griliches (1964) was the first to use a production function to estimate the effect of education on agricultural output. His method was replicated by Kislev in 1967 using the same data differently aggregated, but the results did not confirm the earlier findings.

On the empirical work, a number of studies, for example, Huffman (1974), Fane (1975), Wu (1977), Lockheed et al. (1980), Jamison and Moock (1984), Rosenzweig (1995), Singh and Santiago (1997), and Yang (1998) have analysed the effects of education on farm efficiency. The large majority of the literature uses either the education level of one individual in the household or the average level of education in the household.

Chaudhri (1979) discussed four possible effects of schooling: the worker effect, the allocative effect, the innovative effect and the external effect. Based upon his own empirical work, he concluded that an examination of data at the household level will reveal only direct (worker) effects of schooling on output. As the level of aggregation is increased up to the state level, more of the allocative, innovative and external effects will be picked up, and eventually a level of aggregation will be reached at which all external effects are internalised.

Jamison and Lau (1982) developed a theoretical framework to examine the role of education and its effects on agricultural production. They developed new empirical evidence concerning the relationship between farmer education and farm efficiency using three data sets obtained from surveys of individual farms in Korea, Malaysia and Thailand. The function used is the Cobb-Douglas production function. The data consist of observations of 1904 farmers in Korea, 403 farmers in Malaysia and 440 farmers in Thailand. The Korea farms were divided into mechanical farms and nonmechanical farms. For 1363 mechanical farms the dependent variable was value of agricultural production and the independent variables are (i) land (ii) human labour, animal labour and machine labour (iii) capital employed, fertilizers and pesticides used (iv) gender of head of agricultural household and (v) age of head of household (vi) education status of farm managers. Based on 541 nonmechanical farms, the function was estimated by relating value of agricultural production to the independent variables of (i) education level of head of household (ii) land (iii) human labour, animal labour (iii) capital employed and use of fertilizers and pesticides (iv) gender of household head (v) age of household head. In the model, education variable was taken to be average number of years of education for household members aged 17 to 60.
Jamison and Moock (1984) discover a threshold effect in Nepal: farmers with one to six years of schooling are not significantly more productive than those who have never been to school, whereas those with seven or more years of schooling are more productive than those with less education.

Cotlear (1990) tested the Schultz hypothesis using data from three regions in the Peruvian sierra which were similar in their ecology and other salient characteristics, but which differed in terms of the degree of modernity of agricultural production. His estimates of agricultural production functions in each region show that education raises farm output. However, the relevant level of education depends on the farming technology employed. In areas which have just begun to modernise, basic literacy and numeracy are sufficient to foster growth. To ensure continued technological advancement, higher levels of education are required.

The production function approach has produced evidence of a link between education and agricultural output in the developing world literature. Hussain and Byerlee (1995) note that evidence is mounting (for Asia at least) that returns to schooling in agriculture may be as high as for urban wage earners.

Furthermore, Lin (1991) examined whether the education level of the head of household and the average level of household education affect adoption of new farm technologies in China.

Educated farmers are more productive. (Weale, 1992: 3)

Lovell (1993) notes that this two-stage procedure rests on the assumption that factors such as education affect the efficiency of the farmer in transforming inputs into output but do not affect the process by which production occurs. If the variables used in estimating efficiency are correlated with the variables used to explain efficiency, the coefficients on the variables used in the first stage to estimate efficiency will be biased. A one-stage model in which all variables, including education, appear in a single equation to estimate efficiency may alternatively be specified. This reduces the problem of omitted variable bias, but may lead to multicollinearity. There is an important difference between the two-stage and one-stage model: in the one-stage model, efficiency is measured controlling for variables such as education; in the two-stage model, efficiency is measured without controlling for variations in education in the first stage, and regressors such as education are used to explain variations in efficiency in the second stage.

Foster and Rosenzweig (1996) and Behrman et al. (1999) showed that anyone within a household having primary education is an important predictor of adopting new farming technology and profitability during the time of the “Green Revolution” in India. However, recent studies on the effects of education on farming pay more attention to the motivation for investing in human capital. Admassie and Asfaw (1997) note that Ethiopian farmers have faced frequently changing input and output prices under the new government. In addition, unpredictable weather, pests and crop disease all contribute to an environment in which farmers must adapt frequently in order to survive. As a result, there may be an efficiency advantage for farmers who are better prepared to anticipate and cope with disequilibria. Thus, even in the absence of innovation, farm productivity may be enhanced by investments in education.

Several studies (for example, Huffman (1980), Yang (1997), Fafchamps and Quisumbing (1999), Lanjouw (1999), Yang and An (2002), and Kurosaki and Khan (2004)) found that farmers respond to higher returns to education in the non-farm sector by reallocating labour away from agriculture.

The adverse effects on national capacity for development that the prolonged economic and political difficulties that most African countries faced in these last two decades could be summarised as follows: a weakening of public administration systems in general and civil service systems in...
particular; a decline in the quality of systems of education at all levels; and, in particular, at the tertiary levels; declining investments in the social sector, particularly in the education and health sectors – in some countries this has resulted in a reversal of the some of the gains that had been achieved in earlier periods; the out-migration of significant segments of the education elite...; and a weakening of the institutions of civil society as a result of the prolonged economic and political crisis (Kifle: 1998: 81).

Wadud and White (2000) compared the estimates of technical efficiency obtained from the stochastic frontier approach and the Data Envelopment Analysis (DEA) approach using farm level survey data of rice farmers in Bangladesh. Data were collected from 150 farms in two villages. The dependent variable was the value of rice output and the independent variables were land, labour, irrigation, fertilizer, pesticides, age, schooling, and plot size. The study pointed out that the coefficient on years of schooling was positive indicating that more years of schooling tended to lead to worker technical efficiency in agricultural production.

According to the World Bank, primary education is the single largest contributor to growth in developing countries. A farmer with four years’ schooling is much more productive than one who has no education. (ILO, 2002: 4)

Many studies have shown that schooling improves productivity in rural and urban self-employment. Early evidence suggested that four years schooling was a critical period. More recent work has suggested that additional years continue to make a difference. (UNESCO, 2002: 34)

Tertiary education institutions support knowledge-driven economic growth strategies and poverty reduction by (a) training a qualified and adaptable labour force, including high level scientists, professionals, technicians, teachers in basic and secondary education, and future government, civil service, and business leaders; (b) generating new knowledge; and (c) building the capacity to access existing stores of global knowledge and to adapt that knowledge to local use... Sustainable transformation and growth throughout the economy are not possible without the capacity-building contribution of an innovative tertiary education system. This is especially true in low-income countries with weak institutional capacity and limited human capital. (World Bank, 2002a: xx)

Female education has ‘positive effects on levels of agricultural productivity. This relationship has been well documented for many years [Jamison and Lau, 1982]’. (UNESCO, 2003: 30)

There are of course many other sources that also underline the importance of the external context for its impact on what happens in schools, for example the EFA Global Monitoring Report (GMR) on Quality (UNESCO, 2004).71

The benefits of literacy ensue only when broader rights and development frameworks are in place and operating effectively. Individual benefits, for example, accrue only when written material is
available to the newly literate person and overall economic benefits only when there is also sound macroeconomic management, investment in infrastructure and other appropriate development policy measures. Similarly, certain benefits, such as women’s empowerment, will result only if the social cultural environment is accommodating of them. (UNESCO, 2005: 137-138).

Qualified professional staff is essential to all forms of development. The delivery of health, education and other services depends on them. They are crucial for collecting and managing data, and debating and developing good policies, based on the evidence of what works and what does not. They are essential to implementing those policies and to monitoring how they are put into effect. Scientifically and technically proficient staffs are needed to identify opportunities arising from innovation and scientific discoveries and to develop effective policy in areas such as science, trade and resource management. Especially in the private sector, these particular skills are key to performance and innovation. Africa has been lacking skilled men and women in all these spheres. (Commission for Africa 2005: 137)

The role of education and experience of farming in rice productivity: case study in Kyauktan Township, Myanmar was examined by Khin May Than (2003). The paper had demonstrated that education and experience played an important role in rice productivity of rice farms in Kyauktan Township. The opportunity for farmers to have more formal education should be encouraged whereas non-formal education through continuing education programs should be strengthened. In particular, short training on new techniques, trying out new technology, regular contact with extension workers and other non-formal education should be continuous processes which will help build up strong and sound experience for the farmers in carrying out their work.

Conclusion:

Various studies suggest that rural education increases agricultural productivity. Education has a positive effect on the Agricultural Productivity. Education and training can change the attitude of a farmer. By continuous training and exposure to various crop demonstrations would enable the farmer increasing their mental horizon enhancing their positive attitude qualities and helping them for adoption of new agricultural innovations. The farmers trained such and exposed to outside can be a role model for other farmers and educating them through non-formal education so that they also can adopt the new technologies for increasing the productivity. The dissemination of new information and demonstration of new skills for the benefit of the community-at-large is the function of agricultural extension activities. Extension is an organised effort to abridge the time required for transfer of new practises from the laboratory to the field. It enhances the farmer’s own life experience with the live demonstration of new things he has never known or seen before.

References:


