



IMPACT OF CREDIT MANAGEMENT ON AGRICULTURE OUTPUT IN PAKISTAN

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ABSTRACT

There is a profound impact of agriculture credit on output, employment, and capital accumulation especially for agriculture-based economies like Pakistan. The empirical results show that agriculture sector output is positively and significantly affected by capital stock and labor force. The improvements in mechanization, seeds quality, timely availability of fertilizers and pesticides backed by enhanced farm management skills and the adoption of modern techniques have contributed to increasing agricultural output. Therefore, the policy initiatives fostering this transition will have a positive impact on overall agricultural practices in Pakistan. The productivity of capital and labor has increased mainly due to making available water at farm gate, installation of cost-effective techniques for tube wells, and easy access to credit for farmers. Central Bank has installed a mechanism to check the outflow of agriculture credit to other sectors of the economy that has improved the apportion efficiency of the available resources resulting in enhanced output.

KEYWORDS: Agricultural Finance; Agricultural Policy, credit management, policy initiatives, Pakistan.

1. INTRODUCTION

The agriculture sector is the mainstay of Pakistan's economy as more than 66% population is directly dependent on it for livelihood; generates more than 44% of direct employment; contributes 21% in GDP; and, amounts up to 11% of exports earnings (Economic Survey of Pakistan, 2016). This sector is also the main contributor to generating raw materials for the industrial sector for further value addition. Similarly, it is a huge market for the finished manufactured goods – commercial and domestic. Although this sector has recorded an annual 4% growth over four decades (Ali, 2004) its dependence on irrigation water is very high as almost 90% of production is from irrigated land. Therefore, a huge potential is still untapped in the expansion of breeds of crops, herbs and plants that can be produced in arid areas (Faruqee, 1997). But to achieve growth in this sector, structural and non-structural credit management is necessary that can use new and better financial instruments to enhance productivity.

This paper aims to provide: (1) assessment of credit management on agriculture output; (2) impact of credit management on capital accumulation; and (3) determine the impact of quality and quantity channels of credit management on overall agriculture output. Quantity channels attribute to practices followed for credit management having an impact on enhancing the output of the agriculture sector, whereas, quality channels reflect in improved productivity of labor force (Wizarat, 1981). This can provide better insight for designing agriculture sector policy initiatives. The world Bank has been supporting the agriculture of Pakistan not only in terms of structure but also in non-structural measures to improve the overall productivity especially farm and water management related issues. In addition, the information generated by the study will be helpful for credit managers to assess the risks associated with productivity affected due to different agriculture inputs (The World Bank, 2004). This may, in turn, lead to developing decision making patterns to channelize the scarce financial resources and improve returns to agriculture investments. Agriculture production and credit management are interrelated but empirical literature has generally focused on either aspect but not both especially for Pakistan. The measurement issues to assess the specificity of credit and agriculture output has been generally ignored and thus new developments in theoretical and empirical models are not viewed in recent literature. The study, therefore, addresses this issue to propose practical policy implications.

The rest of the paper is organized as: the following section discusses the general framework of analysis; then the discussion is about the data and methodology along with the main empirical results. In the end, the study concludes with policy implications.

1.1 General framework of analysis

The productivity of any sector is not only affected by the availability of capital and labor but also by the willingness to make deliberate efforts to improve resource efficiency. The difference in the agriculture sector productivity in different regions and countries is attributed to not only the availability of factors of production but also the efficiency in their use. Apart from factor inputs, irrigation and drainage also have a positive impact on overall agriculture production. To make available all the factor inputs the financial sources are essential not only to boost the production but also to minimize the production risks. The study uses a Cobb-Douglas production function with a constant return to scale (Chiang, 1974) by incorporating credit management to develop a framework in accordance with the objectives of the study.

$$(1) \dots Y_t = AK_t^\alpha L_t^{1-\alpha}$$

where A is a positive constant, and α is a positive fraction. The logarithmic transformation makes it straight forward to estimate the coefficients and perform statistical tests for validating the assumption of constant return to scale.

$$(2) \dots \ln Y_t = \ln A + \alpha \ln K_t + (1 - \alpha) \ln L_t$$

As Y, A, K, and L change over time, therefore, it accounts for the growth process which can be attained by differentiating with respect to time yields the following differential equation:

$$(3) \dots \left(\frac{1}{Y_t}\right)\left(\frac{dY_t}{dt}\right) = \left(\frac{1}{A}\right)\left(\frac{dA_t}{dt}\right) + \alpha\left(\frac{1}{K_t}\right)\left(\frac{dK_t}{dt}\right) + (1 - \alpha)\left(\frac{1}{L_t}\right)\left(\frac{dL_t}{dt}\right)$$

It can be written as:

$$(4) \dots \left(\frac{\dot{Y}}{Y}\right) = \left(\frac{\dot{A}}{A}\right) + \alpha\left(\frac{\dot{K}}{K}\right) + (1 - \alpha)\left(\frac{\dot{L}}{L}\right)$$

where ‘ $\dot{}$ ’ denotes the instantaneous rate of change over time; Y is output in the agriculture sector, K is capital input, and L is the labor input at the time ‘t’. It can be seen from equation (4) that the growth rate of agriculture sector output is a function of growth rate in physical capital, labor and technology. It is necessary to estimate ‘ α ’ and avoid the problem of collinearity in the estimation results, and Wald-test can establish the validity of the restriction of constant returns to scale. In addition to the availability of credit, water input is also very important in Pakistan. Therefore, in the light of the objectives of the study, the growth rate of capital and labor productivity is assessed in terms of availability of credit (C - millions of rupees) and water input (W - million-acre feet). Additionally, a number of tube-wells (T) and the use of electricity (E – gigawatt hours) as also included as control variables. Thus, the linear form of relationship can be stated as:

$$(5) \dots \left(\frac{\dot{K}}{K}\right) = \alpha_0 + b^*W + c^*T + d^*E + e^*C + U_t$$

$$(6) \dots \left(\frac{\dot{L}}{L}\right) = \beta_0 + \beta^*W + \gamma^*T + \delta^*E + \varepsilon^*C + V_t$$

Where ‘ α_0 and β_0 ’ are the measure of an exogenous component of capital and labor productivity. U_t and V_t are random productivity shocks in capital and labor growth, respectively. The above formulation has policy implications in the sense that policy initiatives affect each of the components appearing on the right-hand side of equations (5) and (6). The respective coefficients can assess the relative impact of each component that can be of interest in terms of responsiveness of productivity to specific factors so considered.

2. DATA AND METHODOLOGY

To assess the effect of credit availability on agriculture output through the impact on capital and labor productivity, the time series data of Pakistan from 1987 to 2016 is used. The data is taken from the Pakistan Economic Survey and the Agricultural Statistics of Pakistan (Government of Pakistan, 1990 - 2016). The study employed the Generalized Method of Moments (GMM) for estimation due to the existence of the problem of simultaneity (Arellano and Bond, 1991). GMM has the added advantage that it accounts for population moment conditions and estimates parameters from corresponding sample moments more efficiently than other related methods of estimation (Arellano and Bover, 1995). Observing the patterns of the data generation process for credit, capital, labor, and water availability,



the model can land into the problem of simultaneity. According to Blundell and Bond (1997) if the problem is not taken care of, then the error terms will become correlated with independent variables. Therefore, to handle these problems the following measures have been taken before estimating the equations:(1) taking the first difference eliminates the sector-specific effect; (2) appropriate instruments for different variables are used (transformations and use of lagged values) for all the equations in levels. The final estimation has, therefore, generated consistent and efficient results that can be used for forecasting and recommending policy initiatives.

3. EMPIRICAL FINDINGS

The estimation results of the basic model indicate that the model is a good fit because of the high values of coefficient of determination and it is inferred that most of the variation in agriculture output (about 84%) is explained by capital and labor inputs. The individual coefficients of capital and labor are also significant and so is the combined impact of these variables. Once the study ascertained the significant impact of factor inputs on agriculture sector output in Pakistan, it furthered its scope by assessing the impact of credit on output growth through quantity and quality channels. The quantity channel works through capital accumulations while the quality channel reflects the skills improvement of agriculture labor and practices. A number of tube-wells (T) and the use of electricity (E) are included as control variables in both cases. Therefore, in the presence of these variables, the partial impact of credit and water is assessed that provides important insight into the individual importance of these variables.

Table 1: The Effect of Labor and capital on agriculture output in Pakistan

	$Y_t = AK_t^\alpha K_t^{1-\alpha}$
Intercept	26.5 (16.91)***
The growth rate of labor	19.34 (16.47)*** 7.86
The growth rate of capital	(03.22)**
R ²	0.84
F	12.839

Note: The t-values in parentheses. * significant at 1% confidence level, ** significant at 5% confidence level, *** significant at 10% confidence level.

Thus the information generated therein has important policy implications. Comparing the two channels, the quality channel has a stronger impact on productivity than the quantity channel which is in accordance with the theoretical expectations. Water, Electricity, access to Credit and availability of Tube Wells explains 42% variation in the growth rate of capital whereas it is as high as 83% in case of quality channels i.e. labor productivity. The skills learned to add to the human capital that adds to a permanent improvement in good practices for enhancing productivity.

One important finding here is a significant and negative sign of the coefficient of electricity for both the specifications. The shortage on one hand and the increasing cost of electricity have been a retarding factor for the economic progress of Pakistan. This not only causes delays in water provision to the farms but also makes electricity expensive for the farmers to use.

Table 2: Effect of Credit on Capital Growth and Labor Force Growth Rates

Variables	$\left(\frac{\dot{K}}{K}\right) = \alpha_0 + b*W + c*T + d*E + e*C + U_t$		$\left(\frac{\dot{L}}{L}\right) = \beta_0 + \beta*W + \gamma*T + \delta*E + \varepsilon*C + V_t$	
	Quantity Channel Capital Growth Rate		Quality Channel Labor Growth Rate	
Intercept	-26.83 (2.68)**		-2.645 (-3.72)*	
Water at the farm gate	41.70 (3.18)*		0.16 (18.20)*	
Tube wells	0.033 (5.10)*		3.60 (5.82)*	
Credit	0.39 (5.66)*		2.63 (4.45)*	
Electricity	-4.13 (-4.11)*		-0.006 (-9.37)*	
R ²	0.42		0.83	
F	23.532		54.435	

Note: The *t*-values in parentheses. * significant at 1% confidence level, ** significant at 5% confidence level, *** significant at 10% confidence level

The water-related inputs have a strong impact on overall productivity. It can be seen that the availability of water at the farm gate induces higher use of capital that results in increased productivity. Although the impact of water-related inputs is not as high for the quality channel it is significant and positive. Therefore, for the agriculture sector in Pakistan, the water-related inputs are quite important and need to be further developed for enhancing overall agriculture productivity. The study finds that the credit has a positive and significant impact on productivity in both the channels but it is more significant in the quality channel. The use of credit for enhancing labor skills seems to have a long-lasting impact on the individual farmer welfare as it enables the farmers to learn and acquire skills that make them lesser dependent on the credit in the long run. The improved skills are reflected in the value addition at the farm and better packaging and marketing initiatives. This has increased the wealth and overall wellbeing of the farmers in Pakistan.

The study estimated these effects by imposing restriction of constant returns to scale, but the Wald Test indicated that the restriction does not hold. The rejection of constant returns to scale assumption indicates that in Pakistan their impact of labor and capital on the overall productivity of the agriculture sector is not the same. Labor and capital influence the output differently not only in individual terms but also proportionally. But when the assumption of increasing returns to scale is tested, it turns out to be significant. Therefore, it is inferred that given the timely availability of credit, the impact of capital and labor on agriculture output in Pakistan is displaying increasing returns to scale. The potential of the agriculture sector is huge and proper credit availability not only enhances capital utilization but also the skills of the labor that can reflect in higher output per farm and per worker. It has been seen that credit to the agriculture sector has strong implications for the efficient use of water. The better water use strategies have to lead to not only efficiency but also in preventing wastage of excess water. Therefore, progressive agriculture planning can have a far-reaching indirect impact on the lives of the rural communities that are mostly indulged in sustenance agriculture. If the agriculture sector of Pakistan becomes stable and progressive it will directly improve the living standards of most of her populations and indirectly ease the pressure of unemployment and congestion from the major cities. Therefore, agriculture sector growth is essential for the overall sustainable economic development and growth of Pakistan.

4. CONCLUSION

The study assessed the impact of credit on the agriculture sector output of Pakistan through channels of capital and labor growth over the past thirty years. The GMM reveals that capital and labor have a positive and significant impact on the output of the agriculture sector. Capital stock in the form of farm machinery, seeds and fertilizers along with labor skills of farm management if improving then there is a significant increase in overall agriculture sector output in Pakistan. Wald test has shown that there are increasing returns to scale in the agriculture sector of Pakistan that makes it very attractive for new investments. The paper also incorporated other important inputs like water, tube-wells, and electricity along with the credit. Credit availability has a longer-lasting impact on quality channels of labor



productivity than on capital productivity. Therefore, it is inferred that improving labor skills will help farmers to generate self-sustaining credit and wealth over the long run so keep increasing their farm productivity by value-adding to different inputs otherwise not considered important. The negative impact of electricity cost is retarding the growth of agriculture in Pakistan. Credit availability has a direct significant impact on water management practices that leads to higher farm productivity. Therefore, cheap energy input along with better skills and farm management education is important to agricultural productivity in Pakistan.

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