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Related to Agricultural Research, Distribution of Income and Agricultural Value Added

Zeinab Moinoddini [1,2]

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Abstract

Agricultural Research is one of the most important factors in agricultural development, thus, the role and importance of research is increasing. Within the past years, all developed and consequently developing countries have engaged their most attention to promote their researches indexes. This study is investigating the effect of agricultural research on the distribution of income and agricultural value added in Iran, during the period of 1976 - 2012. Three SLS methods were used to determine the income distribution functions, value added and per capita income. The results showed that agricultural researches were effective on improvement of agricultural value added. The results also express that continuance in agricultural researches can increase per capita income and less inequality of income distribution. Effect of agricultural value added on inequality of income distribution was low but though increase in agricultural value added and decrease it.

Keywords:
Agricultural research, Agricultural value added, Per capita income, 3SLS

[1] *Invited Lecturer Payame Noor University of Kerman, Iran.*
[2] *PhD Student of Agricultural Economics Zabol University of Iran.*
* *Corresponding author's email: zmoinoddini@gmail.com*

INTRODUCTION

Economic growth is a necessary but not the sufficient condition for alleviation of menace of poverty. Economic growth coupled with equitable distribution of income makes possible the participation of the poor in economic activities that experience progress and expansion. A strong agriculture sector is source of accelerated growth but also has its robust poverty alleviating impact in the economy. However, this impact of agriculture sector on growth and poverty can be more effective if there is a strong production and consumption link between agriculture and other economic sectors. Economic growth is defined as development and expansion of resources and economic capacities in a specific period and income distribution considers the distribution of the same resources among the population of the specific society, too (Mehregan and Nassabian, 2010). Economic growth with equity and equality has been the prime objective of economists and policy makers. Economic growth is considered to be necessary for poverty alleviation both by economic theory and policy makers (Ali and Ahmad, 2014). Equal distribution of income provides the stability in an economy by providing the opportunities to the individuals of the society to equally benefit from the growth and development of the economy. In the process of growth, the productive capacity of the economy is increased. This growth of the economy would benefit everyone if the distribution of income is equal in the economy. On the other hand, with the higher income inequality the lesser portion of population would benefit from the process of development (Ali *et al.*, 2013). Poverty reduction is the result of growth within agriculture and not to the shift of inputs from low to high productivity sectors, associated with Kuznet's inverted "U" trajectory of inequality rising then falling in the course of development (Datt and Ravallion, 1996 and 1998). Agricultural research can bring about broad-based technological change in agriculture that benefits the poor in many different ways. First, it can help reduce poverty directly by raising the incomes. Second, technological change can help reduce poverty indirectly through the effects of adoption, by both poor and non-poor farmers, can have on the real income of others largely through lower food prices for consumers and increased employment and wage effects in agriculture and other sectors of economic activity through production, consumption, and savings linkages with agriculture (De Janvry and Sadoulet, 2002; Haggblade *et al.*, 2002).The agricultural sector in Iran plays an important role in the Iranian economy. The rapid economic growth achieved by certain Asian countries such as IRAN in the 1990s can be partially attributed to a rapid generation of knowledge and intellectual property, including new technologies. Developed countries tend to spend around 3 percent of their GDP on R&D (Khaksar Astane and Karbasi, 2007). In most developing countries, this average is much lower. Iran spends about 0.5 percent of its GDP on R&D. Nonetheless, its spending levels are well above the average of around 0.2 percent for Islamic world as a whole (Marashi, and Sheykhan, 2004). Fulginiti *et al*., (2004) found that while the estimated rate of productivity change was 0.83% per year over the four decades, the average rate from 1985 to 1999 was a strong 1.90% per year. Similarly, Coelli and Rao (2005) reported that, over the period 1980–2000, productivity growth in Africa averaged 1.3% per year, much higher than the growth rate achieved by South America, and almost at par with that of Europe, which recorded a growth of 1.4%. Thirtle *et al.*, (2003) modeled such a pathway in assessing the impacts of research-led agricultural productivity growth on poverty in a sample of developing countries in Africa, Asia, and Latin America. In this paper, a simultaneous system of equations model that accounts for endogeneity of key macro-economic variables as well as for long term CGIAR operations was specified and estimated using three-stage least squares. The independent variables were selected based on the theoretical as well as empirical literature. Alston *et al*., (1995) argue that the lag between the inception and completion of a line of research (i.e., research gestation lag) can be around 2–3 years for some crop-management

types of research such as developing improved fertilizer recommendations.

A cross-country examination of the relationship between growth and poverty by Gallup et al. (1997) establishes that a one percent increase in agricultural GDP leads to a 1.61% increase in income of the poorest quintile, while the corresponding values for the manufacturing and services sectors are only 1.16% and 0.79%. Other cross-country studies (Bourguignon and Morrison, 1998; Timmer, 1997) provide further evidence of the pro-poor bias of agricultural growth, with only the results of White and Anderson contradicting this view. Timmer (1997) finds that manufacturing reduces poverty directly due to an increase in the income of employed workers, but it also worsens the distribution of income, reducing the effect on the poor, in contrast agricultural growth, which is not associated with worsening income distribution. Bourguignon and Morrison (1998), using a sample 38 small and medium size developing countries find that growth in agriculture and in basic services reduced poverty more than expanding industrial output. Ravallion (1995) used data from 36 developing countries, representing 78 percent of the population of the developing world, to assess the growth-poverty link during the 1980s. Growth reduces poverty, but has no systematic effect on inequality, suggesting that income gains were evenly spread. However, the econometric analysis left "a sizable unexplained variation in country performance at reducing poverty for a given rate of growth." In other words, clearly other factors matter too.

Bruno *et al*. (1996) reviewed the recent evidence and found that while income inequality differs significantly across countries, there is no discernable systematic impact over time of growth on inequality. However, there are exceptions, as a general rule sustainable economic growth benefits all layers of society roughly in proportion to their initial levels of living. However, countries that give priority to schooling, health and nutrition are more likely to see improving income distributions and higher average incomes over the longer term. A more equitable distribution of physical assets, notably land, can also help greatly.

Ali and Ahmad (2014) found that poverty alleviating impact of livestock sector, human capital, remittances from abroad and employment per factory in Pakistan. Results also show Household size increases poverty levels, poverty gap and poverty severity in the economy. The study also suggests some policy recommendation for the development of livestock sector in Pakistan. Considering noted Studies and the necessity of research, in this study is investigating the effect of agricultural research on the distribution of income and agricultural value added in Iran, during the period of 1976 - 2012 is discussed. Three SLS methods were used to determine the income distribution functions, value added and per capita income.

MATERIALS AND METHODS

A significant pathway of impact of agricultural research on poverty is in Iran. First, agricultural productivity is modeled as a function of lagged agricultural research expenditures and production factors, including fertilizer, labor, machinery, and irrigation. Second, GDP per capita is modeled as a function of agricultural productivity, land per agricultural worker, government expenditures, gross fixed capital investment, and the rural population as a percentage of total population. Finally, poverty is modeled as a function of income inequality, GDP per capita, government expenditures, and gross fixed capital investment and population growth rate (Alene and Coulibaly, 2009).

$$LVa=\alpha1+\alpha2LRe+\alpha3Re1+\alpha4LFer+\alpha5LLab+\alpha6LMac+\alpha7LIrr \quad (1)$$

FER: amount of fertilizer used (Kg / ha), LAB: labor, MAC: Tractor ha, IRR: Irrigation

$$LGDP=\alpha8+\alpha9LVa+\alpha10LLand+\alpha11LGoex+\alpha12LFci+\alpha13LRup \quad (2)$$

LAND: infield, GOEX: government expenditure, FCI: Agricultural Gross fixed capital, RUP: rural population,

$$LPove=\alpha14+\alpha15LGDP+\alpha16LGoex+\alpha17LFci+\alpha18LPogr \quad (3)$$

Poverty here means that the Gini coefficient, an indicator of inequality in income distribution is shown.

POVE : poverty, POGR: population growth

In another part of the study is to calculate return on investment in agricultural research (Alene and Coulibaly, 2009) $\frac{(\alpha_{re})(\overline{VA}/\overline{RE})}{1+ROR}=1$

α_{Re}: Sum of coefficients obtained from estimating the simultaneous equations $\overline{VA}$: average of value added, $\overline{RE}$: average of research expenditures, ROR: rate of return on investment.

The data is used in this study by a nation's official statistics, data from the Central Bank of the Islamic Republic of Iran and FAO website.

RESULTS

According to Table 1, in first equation Iranian Agricultural Research cost in the first year (Re) and value added of agriculture had a significant positive effect. Agricultural Research costs with one-year interrupt (Re1) had significant positive effect also and this effect was not significant in Iran. Due to the growth of Iran in recent years in research and development of research and Technology, expanding in recent years is justifiable. Variable effects of nitrogen (Fer) and irrigation (Irr) the agricultural value is meaningless, that due to the subsidized fertilizer in Iran. Variable labor force (Lab) has the significant negative effect on the value added and the reasons for this could be the simultaneous use of labor and machinery because labor productivity is reduced and ultimately cause is reduce the value-added agriculture and Variable machinery (Mac) significant positive effect has on the value added. Results of second equation indicate that the value added is positive and significant effect on per capita national income. Rural population has significant negative effect

Table 1: Simultaneous equation system estimates of the impact of agricultural research in IRAN.

Equation/variable	Parameter	Estimate	(t-value)
Value-added per hectare			
	α_1	27.51	1.62*
Constant	α_2	0.76	4.65***
Research expenditures (t)	α_3	0.35	2.07***
Research expenditures (t _ 1)	α_4	-0.02	-0.10
Fertilizer (kg per hectare)	α_5	-1.82	-1.68*
Labor (workers per hectare)	α_6	0.58	3.39***
Machinery (tractors per hectare)	α_7	-0.18	-0.30
Irrigation (% of crop land)	R^2	0.72	
GDP per capita	α_8	92.42	2.77***
Constant	α_9	0.57	1.99**
Value-added per hectare	α_{10}	-3.95	-4.57***
Land (hectares per worker)	α_{11}	0.96	1.57*
Government expenditures	α_{12}	0.44	0.98
(% of GDP)	α_{13}	-3.62	-2.10***
Fixed capital investment (% of GDP)	R^2		0.45
Rural population (% of total)			
Poverty	α_{14}	-0.11	-0.78
Constant	α_{15}	-0.06	-3.47***
GDP per capita	α_{16}	0.11	1.86**
Government expenditures (% of GDP)	α_{17}	0.09	1.76**
Fixed capital investment(% of GDP)	α_{18}	0.05	1.691*
Population growth(% per year)	R^2	0.63	

* p<0.1 ** p<0.05 *** p<0.01

Table 2: Elasticities linking agricultural research, productivity, income, and poverty.

	Elasticities	
1	Agricultural productivity—agricultural research	0.34
2	GDP per capita—agricultural productivity	0.57
3	Poverty—GDP per capita	-0.063
4	GDP per capita—agricultural research	=1*2=0.1938
5	Poverty—agricultural productivity	=2*3= -0.0359
6	Poverty—agricultural research	=1*2*3= -0.0122

on income per capita. In addition, the effect of gross fixed capital per capita income is meaningless. Land has a negative effect on per capita income that reduced land efficiency. Government expenditures are positive and significant effect on per capita income. Government expenditure, including costs such as education, health and ... increase agricultural production and ultimately increases per capita income. The third equation results show that income distribution is an inverse relationship with per capita income, that means is that increase in inequality in income distribution has led to increased poverty. The fixed gross capital investment and government costs have a positive effect on poverty reduction. R^2 in three equations are good that represents a good fit.

The percentage change for value-added agriculture, per capita income and income distribution as the elasticity coefficients are shown in Table 2 because as mentioned variables in logarithmic terms in the model. For example, elasticity than the agricultural value of agricultural products 1.1%, which is expressed that one percent increase in research costs, the agricultural added value increased by more than 1% . Results of second equation indicate that the value added is positive and significant effect on per capita national income. Rural population has significant negative effect on income per capita. In addition, the effect of gross fixed capital per capita income is meaningless. Land has a negative effect on per capita national income, that reduced land efficiency caused to it. Government expenditures are positive and significant effect on per capita income. Government spending, including costs, such as: education, health etc., increase agricultural production and ultimately increases per capita income. The third equation results show that income distribution is an inverse relationship with per capita income, that means is that increase in inequality in income distribution has led to increased poverty. The fixed gross capital investment and government Costs have a positive effect on poverty reduction. R^2 in three equations are good that represents a good fit.

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CONCLUSION

Economic growth with equity and equality has been the prime objective of economists and policy makers. Economic growth is considered necessary for poverty alleviation by both economic theory and policy makers. Poverty reduction especially for the poorest can be greatly enhanced through distributional policies. All the evidence confirms that distribution is central to fighting poverty.

In this study, impact of agricultural research on the distribution of income and agricultural value added in Iran, during the period of 1976 - 2012 has been analyzed. The results of the study demand a robust agriculture policy focused on the development of agricultural researches. The results show that agricultural researches are effective on improvement of agricultural value added. The results also express that continuance in agricultural researches can increase per capita income and less inequality of income distribution. Effect of agricultural value added on inequality of income distribution is low but though increase in agricultural value added and decrease it. The results of the study reveal that rural population has significant negative effect on income per capita. The negative impact of this factor on income inequality reveals that the focus should be to improve the human capital situation in Iran. The Government expenditures are positive and significant effect on per capita income the focus of the government must be to increase the Government expenditures for better than income distribution.

We can be proposed increasing research expenditures, because due to the positive and significant effect it on the value added agricultural, we can by this factor increased Agricultural value added. Then with policy that increases of value added of agricultural, Increase the per capita income and low inequality in income distribution.

According these results Small changes in distribution can have a very large effect on poverty reduction. There are cases where inequality levels have changed relatively quickly. Moreover, the lack of knowledge of the determinants of inequalities and the relative neglect of distribution issues in recent decades may mean that there is untapped potential for reducing poverty through distribution changes.

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