©The Pakistan Development Review
51:4 Part II (Winter 2012) pp. 51:4, 277–287

Agricultural Productivity Impact of a Mini-Dam: A Case Study of Ziarat, Balochistan

ZOHAIB SAEED, USMAN MUSTAFA, HAFSA HINA, and SHAZIA SAEED

1. INTRODUCTION

Water is the most important constituent of life without which, life cannot exist. Water is a natural resource which is also used as an input for producing different goods in factories for industrial use, productivity of crops for agriculture use also used in our daily life for domestic purpose. Despite such an importance, still the World is experiencing the issue of water scarcity [WCD (2000)]. The supply of water does not meet its demand [Bengali (2009)]. Pakistan is an agrarian economy which is also heavily dependent on water. About 45 percent of the total employment is generated from Agriculture sector [Pakistan (2011)]. Main sources of water are rivers and rainfall.

Balochistan is the largest province of Pakistan. Land size is 44 percent of the total land of Pakistan [Balochistan (2010)]. Land is fertile and provides conducive environment for Agriculture. Agriculture productivity is high in Balochistan. Many vegetables and crops are grown which results in many farmers and labours livelihood. It has got varieties of species of many fruits, particularly Apple. Important fruit crops grown are Apple, Grapes, Cherry and Peach. Climate is also suitable for crops growth particularly the deciduous fruits like apple, which requires low temperature during summer season. As far as quality is concerned, apple produced in Balochistan, especially at high altitude (1600 meters to 2000 meters) are superior in quality than that produced in the rest of the country. The main reason is that due to dryness of the climate in apple producing areas like Ziarat, Killa Abdullah, Pishin, Quetta etc. Apple is one of the most popular fruit. It is delicious and crunchy and is mostly liked by health conscious and fitness lovers as it is filled with rich phyto-nutrients, which is very essential for optimal health. It also contains antioxidants, which promotes health as well as prevents several diseases. Thus, apple truly justifies the famous sayings, "An apple a day keeps the doctor away." One of the distinguishing features is that there are no fungal diseases and disease free apple can be stored for a longer period in cold storage. Also the abundance of sunshine in the growing season improves the colour of apple which fetches a good price in the domestic and foreign market.

Zohaib Saeed <lifestyle840@hotmail.com> Mazars Consulting, Pakistan. Usman Mustafa <usman@pide.org.pk> is Chief, Training Programme at the Pakistan Institute of Development Economics (PIDE), Islamabad. Hafsa Hina <hafsahina@pide.org.pk> is Lecturer (Econometrics) at the Pakistan Institute of Development Economics (PIDE), Islamabad. Shazia Saeed <shazia_botany@yahoo.com> is Lecturer, Department of Botany, University of Balochistan, Pakistan.

Balochistan, being located far from Indus River, experiences water scarcity more than other provinces of Pakistan [Bengali (2009)]. Main source of water is rainfall but, the last two decades shows a downward trend in the water table due to lack of rainfalls [Shah, *et al*. (2002)]. Both surface and ground water level is deteriorating day by day [Balochistan (2010)]. Due to this situation, farmer's conscious to save trees and grow crops with such water scarcity condition is out of question. Water scarcity is the major constraint behind the lack of its productive capacity. Most of the natives of this district are dependent solely over agriculture. The basic purpose of dams is to store water in wet times and provide water in dry times [WCD (2000)]. It also helps in ground water recharge near the open surface wells particularly in Balochistan. The mini-dam selected for this study is Kawastangi storage dam. It is located in village Kawas at district Ziarat, Balochistan. Its distance is 90 km from Quetta city. Its catchment area is 27.4 sq. km, storage capacity is 2463309 m^3 and height is 29.87 m [Cameos, *et al.* (2008)]. No study has yet shown the impact of mini-dam on the agricultural productivity, particularly apple. This study shows apple production function using mini-dam indicated by dummy variable which not only increases apple productivity, but, it also improves quality, taste, size as well as reduction in the cost of irrigation as dam water is free of cost.

Many studies have been conducted regarding agricultural productivity for several crops. [Bathan and Lantican (2010)] found that the amount of fertiliser and adequate labour significantly improved banana yield. On the other hand, farming experience and education resulted in the decline in banana yield. [Ahmad, *et al.* (2005)] determined factors affecting carrot yield. Study showed that sowing along with higher amounts of seed and fertiliser significantly improved carrot yield, while high input prices, limited capital and insufficient labour were found to be insignificant. [Baksh, *et al.* (2004)] studied the determinants of cauliflower yield and revealed that years of farming experience and education, household size, use of farmyard manure and inorganic fertiliser, and number of irrigation systems positively influenced cauliflower yield.

2. METHODOLOGY

Basic objective of this paper is to find the significance of mini-dam on the agricultural productivity, specifically on the production of apple in Balochistan. The study reveals the estimation of an econometric model for apple production function. Primary data is collected by a pre-tested questionnaire from eighty apple growers, forty from each village. Therefore, the data for this analysis is cross sectional regarding apple yield as an output against eight explanatory variables included as inputs of production and grower. So far no study has been conducted in Balochistan which identifies the explanatory variables that affect the apple yield using dam water as the main source of irrigation, therefore, the study used multiple regression model of the Cobb-Douglas production functional form [Baksh, *et al.* (2004); Ahmad, *et al.* (2005); Bathan and Lantican (2010)] for estimating apple yield using Ordinary Least Squares (OLS) technique. Detail regarding the model is explained below.

Model for Apple Production Function

The yield response model for the sample apple growers considered nine explanatory variables including inputs of production and grower, and specifying importance of a mini-dam is given as:

$$\ln AY_i = \beta_0 + \beta_1 \ln LS_i + \beta_2 \ln FEX_i + \beta_3 \ln FED_i + \beta_4 \ln PA_i + \beta_5 \ln FER_i + \beta_6 \ln IRR_i + \beta_7 \ln PRU_i + \beta_8 \ln P_i + \beta_9 \ln D_i + e_i \quad \ldots \quad \ldots \quad (1)$$

where: ln = natural logarithm;
AY = apple yield (crates/ acre);
LS = land size (acre);
FEX = years of farming experience;
FED = farmer education (formal education);
PA = age of plant/ tree (per acre);
FER = fertiliser (kg/acre);
IRR = irrigation number;
PRU = pruning (per acre);
P = pesticides (litres/ acre);
D = dummy (1 if dam, 0 if no dam);
β_0 = intercept;
β_i = regression coefficients; and
e = error term.

Where *AY* stands for Apple Yield, which is a dependent variable. Following are the independent variables with justification and expected sign:

Dummy variable is included in the model to show the difference between the two villages in terms of production and hence, profit of farmers, selected for the study. It is the most important variable as this determines the impact of mini-dam. One village refers to farm having a dam, while other village has no dam. Two villages are selected particularly for this purpose i.e. one is irrigating farm from both sources of water (dam and tube-well) while other village is dependent upon tube-wells only that is very costly. The village having dam pays less on irrigation and thus, earn higher profit as compared with other village which is having no dam facility. Kawas village should have higher production as compared with Verchoom village. Despite this fact, water quality is also different which affects the productivity. Thus, expected sign of dummy variable is also positive. No such study has been conducted for production function using a dummy variable for highlighting mini-dam influence on the crops for different regions within same district.

LS is the cultivated area/ farm where Apple trees are grown. It is an important independent variable because the larger the farm size, the more will be the production and vice versa. This variable is used to find out whether farm size affects apple productivity or not. Number of trees per acre of land is not used instead as it varies from farmer to farmer and both villages are having separate number of trees per acre of land which already shows variation and thus, farm size is more feasible to use than number of trees per acre. Studies showed inverse relationship between them [e.g. Kiani (2008); Ahmad and Qureshi (1999)]. Expected sign of land size is positive for this study by assuming that increase in size of the farm would increase apple productivity.

As far as FEX is concerned, it is calculated from farmers' that part of age, after becomes 18 years old. Difference between 18 years and the present age of farmer will give farming experience. It also plays an important role in the production process because the more the farmer is experienced, more will be the production of Apple and vice versa. Expected sign of this variable is also positive. Several studies have been conducted regarding production function in Punjab who had taken into account farming experience as an explanatory variable [Ahmad, *et al.* (2005); Baksh, *et al.* (2004)].

FED is calculated in number of schooling years passed. It gives farmers technical knowledge and know how in maximise their output, revenue and to move towards innovations for producing better variety and quality of Apple, so that it may be sold at a high price and yield more profit. Thus, its expected sign is also positive. Studies also used education as an explanatory variable regarding their production function to see how much influence will that have on their yield [Bathan and Lantican (2010); Ahmad, *et al.* (2005); Baksh, *et al.* (2004)].

Age of plant/ tree also matters in the production of Apple. The size of the trees is not so large, but, with its age, it starts producing large quantity of Apple as compared to the time when it was small. The stems and leaves of this tree expand and cover more area and therefore, should produce more output. Hence, it should also increase the production of apple. So the expected sign of this variable is also positive. Study showed that more than 50 percent farmers in Ziarat district had planted apple trees only for generating high returns/ income [Khair, *et al.* (2002)].

Several fertilisers are used in Apple production by farmers in both villages. It varies from farmer to farmer according to their land size, number of trees grown and their affordability. The expected sign of this variable is positive. That is why it is also an important variable in the production process. It provides nutrients to the plants which helps them grow faster and of good quality. Studies also used fertiliser as an explanatory variable and considered it as most important input used in the process of production of crops [Bathan and Lantican (2010); Ahmad, *et al.* (2005); Baksh, *et al.* (2004)].

Irrigation number is calculated by number of times farm is irrigated by the farmer. It is the most important variable especially for Apple production function. It not only provides water to the crop as its input, but, is also plays a crucial role in determining their profit as it is most expensive input as compared with others. Other studies also added irrigation number as explanatory variable for finding its impact over the productivity [Ahmad, *et al.* (2005); Baksh, *et al.* (2004)]. Recommended irrigation for apple trees is 10 days for small trees while 15 days for large trees [Baloch and Achakzai (n.d.); Raja and Baloch (n.d.)]. Despite the fact, growers in the study area irrigate after 18 to 20 days in Verchoom to avoid cost, while Kawas irrigate after 17 days as it has dam water which increases the irrigation duration and lasts long in the soil.

PRU is a process of cutting and setting trees by making them strong and healthy, to provide maximum sunlight and air to the crops. For apple tree cultivation, continuous pruning is required till the end of a season. New apple trees are pruned for first three to four years in order to provide better foundation of the tree, so that subsequently little cutting, setting and cultivating would become easy on these trees. It not only helps in increasing the size of the flower but, it also plays an important role in providing better quality apple which will provide high returns. If the stems are fixed properly through

various cutting tools by farmers or labours, it will also increase production. This process is practiced before the growing season and it also leads to some cost as specialised labours are hired and paid for this purpose. Expect sign for this variable is also positive. Several other studies included pruning as an explanatory variable due to such importance in productivity of fruits especially [Albert, *et al.* (2010)].

Pesticide is also used as an input. The purpose of pesticide is to kill insects and pests. Due to this, the quality of crops remains good which also increases its life and fetch a good price in the market. Expected sign of this variable is positive as pesticides increases Apple quality and thus, increases its yield. So such study has been viewed using pesticide as an explanatory variable yet.

Intercropping was not included in the production function despite it exists in the apple orchard due to two reasons: firstly, it has no impact on apple productivity and has separate cost of production which has not been encountered in the given model. Farmers of these villages do intercropping for domestic use only unlike apple, which is their cash crop used as main source of income generation. Secondly, intercropping is performed during the first four years of apple plantation only due to the existence of large space in between the new grown plants which creates a room for intercropping like tomato, potato etc.

3. RESULTS AND DISCUSSION

The production function for Apple is linear in parameters; therefore, OLS technique is suitable for the estimation of unknown coefficients of regression model (1). Our goal is not only to obtain estimated $\hat{\beta}s$ but also to draw inferences about the true βs. To that end, we also need to satisfy the assumptions of classical linear regression model. For example, before applying OLS method it is necessary to confirm no linear relationship between the independent variables (problem of Multicollinearity). Under this problem OLS generates unbiased estimators with high variances and influence the inferences about the population parameters.

We have constructed a correlation matrix of explanatory variables for the detection of Multicollinearity. It has found linear association between fertiliser and pesticide that is 0.83.In literature, Ridge Regression (RR) is commonly used in case of near or perfect collinearity of the predictors. The idea behind RR is to reduce the variances of estimator by introducing biasness. It requires the incorporation of an extra parameter in the model known as "ridge parameter". Its value is assigned by the analyst, and determines how much RR departs from OLS regression. If this value is too small, RR cannot fight collinearity efficiently. If it is too large, the bias of the parameters becomes too large. Therefore, theory cannot alone calculate the optimal value for the ridge parameter from the data. It has to be estimated by a series of trial and errors. Moreover, fine results about confidence intervals and tests in OLS regression are lost, and have to be replaced by complex and approximate results of RR [Bodunov (2006)]. With these limitations we prefer to adopt Blanchard (1967) approach. According to him, drop the less important independent variable from two highly multicollinear independent variables. Therefore, we choose to remove the pesticide from the production function instead of fertiliser because farmers in Balochistan do not use pesticide much as compared with fertiliser as

they experience dry and cold weather which is not an ideal condition for pesticide growth. Other major reason for removing pesticide instead of fertiliser is that fertiliser was highly significant as compared with pesticide which makes it fit in model instead of pesticide. The results of OLS regression is reported in Table 1.

Table 1

OLS Model for Apple Production Function
Dependent Variable: LOG(AY)

Variable	Coefficient	Std. Err.	t-Stats	Prob.
C	0.4506	1.6039	0.2809	0.78
DUMMY	0.4326***	0.1174	3.6852	0.00
LOG(LS)	0.1590**	0.0835	1.9039	0.06
LOG(EDU)	0.1620**	0.0746	2.1708	0.03
LOG(FEX)	0.1353	0.1468	0.9213	0.36
LOG(FER)	0.3818***	0.0939	4.0621	0.00
LOG(PA)	–0.0696	0.2499	–0.2785	0.78
LOG(IRR)	0.1911**	0.0975	1.9585	0.05
LOG(PRU)	0.1049	0.0805	1.3028	0.19
Adjusted R-squared	0.37	F-statistics		6.72

Source: Study Result.
***, ** and * Significant at 1, 5 and 10 percent probability level.

JB test was conducted to test normality of the residuals while White test was performed for testing Heteroscedasticity. These are the basic tests for testing the normality as well as problem of Heteroscedasticity as in this case, where no such problems were found so there was no further need to go for other tests. The value of JB test was found to be 3.177007 that indicates that the residuals are normally distributed as this value is less than chi-square critical with two degrees of freedom that is 5.99. So we accept the null hypothesis of Jarque-Beratest that the errors are normally distributed. As far as White Heteroscedasticity test is concerned, the calculated value with cross terms is 55.53 (with probability value 0.095) is less than the chi-square critical with 44 degrees of freedom that is 60.48. So we accept the null hypothesis of White Heteroskedasticity Test that errors are homogeneous.

Adjusted R-squared is 0.37 which shows that overall model is a good fit as in this case, where data is a cross sectional (Table 1). Overall model is found to be significant as five out of eight explanatory variables shows positive result. This shows that mini-dam plays a vital role in apple production function. People of Kawas are better off as compared with Verchoom village for not having a mini-dam.

Result shows that dummy variable is highly significant at 1 percent. One of the reasons is that mini dam provide water whole year. Up till 2 acre of land, no tube well water is required as dam water is sufficient for whole season. It is economical and farmers pay negligible price. Moreover, the water is full of minerals and impurities that help the apple to produce both quality and quantity. The duration of irrigation is more for the land which is irrigated by dam water than the land dependent over tube well only. No such study has shown such relation however, this is the first study presented highlighting

the importance of dam in the production of apple which not only increases productivity, but, it improves quality, taste, shape, size along with reduction in cost of irrigation as dam water is almost free.

LS is positively correlated with the quantity of apple. The higher the size of the land more will be the output of apple and vice versa. The basic reason behind this result is that the size of land helps in growing more apple trees. As number of trees increases, the output per trees also increases i.e. if one tree could produce 12 crates, then 80 trees could produce 960 crates per acre of land. Furthermore, farmer could have the opportunity to produce more trees per acre of land with the increases in land size. In this way, per unit production is increased with the increase in size of the land. Thus, output would also be increased with increasing returns to scale. But, there is a limit to plant certain trees per acre. The recommended number of trees depends upon the variety of apple. It is its total biomass that matters. If we plant more trees than recommended, then there will be over lapping and that will adversely affect the yield. However, study shows that there exist an inverse relationship between farm size and productivity as small farmers produce more output than large farmers does per acre due to properly managing the farm, efficient input use and lower labour cost [Ahmad and Qureshi (1999)]. In addition to this, another study revealed an inverse relationship between farm size and productivity and mentioned that small farmers maximise their inputs use up to a level where marginal productivity becomes negative. They also manage to produce high output per acre, without high levels of capital input use. Middle farmers use inefficient combinations of inputs while large farmers used maximum capacity which is why there exists an inverse relation [Kiani (2008)].

Education of the farmer is positively related with the output of apple. Reasons behind this could be many. Education provides exposure, a knowhow off and on the farm activities. It results in developing farmers thinking productively and brings about more ideas which help farmers to bring innovations in the production process. Farmers who attained education are producing high yield as compared with those who did not. That is the key in higher production of apple because most of the farmers during survey were quiet rigid, were not willing to provide any information and some of those who were interviewed, their production level was low relative to those who were educated. Apart from this result, a study showed similar result where positive relationship exist between education and agricultural productivity for rich countries only; while an insignificant relation for poor or developing countries because education leads to higher agricultural productivity [Riemers and Klasen (2011)]. A positive result occurred again in Punjab study where education is significant with productivity level [Baksh, *et al.*(2004)].

Farming experience is insignificant with apple productivity. The reason is that proper management is required for better quality and quantity of apple instead of farming experience. Even if a farmer is highly experienced, but during some particular season, he could not give proper time to the farm, to look after the farm, to check the condition of apple during growth stages, and to check whether any input ratio exceeds or deficient, to hire more labours when required and harvest on time; it will not result in high yield as shown by the study. A Study conducted in Punjab regarding Cauliflower production also showed a direct relationship between yield and farming experience [Baksh, *et al.* (2004)].

Fertiliser has significant positive effect on the yield of apple. The reason behind this is that fertilisers provides nutrients to the crop and enhance growth. The key is to use high quality nutritious fertiliser having low price instead of mixing several fertilisers of high price. Specific ratio is required for the crop growth and those farmers, who pursue it, receive high output as in this case. Similar results were showed by the studies involving production functions where fertiliser was highly significant and positively affected the yield as it helps the crops to grow and mature, provide nutrients that improve quality and size [Bathan and Lantican (2010); Ahmad, *et al.* (2005); Baksh, *et al.* (2004)].

Plant/tree age is insignificant with a negative sign. Reason behind this is that nowadays, the size of the tree does not matter in producing high output despite the size of the tree is increased. It is due to the fact that already 70 to 80 trees are grown in per acre of land. When the size of tree is increased with age, the stems of tree are intersecting one another and it forces the stems to alter their direction. In this way, few stems are forced to bend downwards where the size of apple is affected because apple crop do not receive sunlight which is important for its growth. There is yet no study which could show the impact of tree age with its productivity, however, one study showed the reason of planting apple trees in three northern districts of Balochistan including Ziarat. Almost 50 percent farmers responded that they have planted trees to get high returns/ income [Khair, *et al.* (2002)].

IRR is positively significant. It is because of the fact that production process is based upon a specific irrigation cycle, requires water on every thirteenth or eighteenth day depending upon dam or tube well water. Reason behind its significance is that farmers in both villages are very conscious about irrigation. They provide water on time. Even if dam is not available, farmers manage water for irrigation purpose by other alternative source like tube wells. The lesser the cost on irrigation, the more would be the output and vice versa. A study showed that irrigation number is significant with yield in Punjab. As irrigation number increases, output will increase and vice versa [Baksh, *et al.* (2004)].

PRU is insignificant. The reason for its insignificance is may be due to the fact that it is highly technical which requires specialised labours for such purpose. These labours charge a huge price as they are professional and put strong effort for pruning. Farmers either hire nonprofessional labours or perform Pruning by themselves as it is cost effective. Therefore, Pruning has adverse impact over Apple Yield as it has not been done properly. Pruning is one of the most important steps involved in healthy growth of the crop. Only unwanted, dry and weak roots are pruned. A study showed a direct relationship between pruning and blueberry yield [Albert, *et al.* (2010)].

Thus, overall study shows that the impact of KawasTangi Storage Dam is positive on agriculture productivity. The beneficiaries of this mini dam are much better off as compared with the past. Existing orchard has been saved which was destroyed during the drought of 90's. More area is under cultivation now after the creation of mini dam. Command area has also been increased that generates more revenue to the farmers. The cost on irrigation in Kawas village is negligible due to mini dam. The quality of apple is high by using dam water which is why; the returns are also high as compared with other village. Despite both villages are having same conditions like climate, rainfall and crops grown etc. The main difference between their incomes (profit) is the cost on irrigation as shown in results.

4. CONCLUSION AND POLICY RECOMMENDATION

The study examined the impact of mini-dam on agricultural productivity, particularly Apple, in the two villages of Ziarat district, namely Kawas and Verchoom. Eight explanatory variables were used, most of which are inputs in the production process. Empirical analysis was performed using Cobb-Douglas production functional from. It is concluded that overall model is significant and possess an increasing returns to scale. All variables are found significant except farming experience and tree age. Dummy variable is found to be highly significant which shows the impact of mini-dam is very high and Kawas farmers are far better off than Verchoom mainly because of having dam. Furthermore, storage capacity of mini dams should be made high which will provide more water for irrigation to the farmers. Farmers should educate their children so that they become learned farmers in the future that may also help to increase their yield. Agriculture credit should also be provided to farmers so that they may increase the farm size for production and hence, their output. Government should create such projects in which farmers are trained in workshops to create awareness among farmers for using a desirable amount of fertilisers, pests and other nutrients which would also increase the productivity of apple, particularly in Balochistan. Access to agriculture inputs should be made easy and economical which will facilitate farmers to increase the yield and generate revenue. Land resource use should be used at optimal level to achieve high productivity and prosperity and hence, high returns. Sustainable use of water should be followed to save more water and avoid wasting it as water is a scarce resource.

REFERENCES

Ahmad, B., H. Sarfaraz, and K. Baksh (2005) Factors Affecting Yield and Profitability of Carrot in Two Districts of Punjab. *International Journal of Agriculture and Biology* 5, 794–798.

Ahmad, M. and S. Qureshi (1999) Evidence on Farm Size and Land Productivity: Implications for Public Policy. *The Pakistan Development Review* 38:4, 1135–1153.

Albert, T., K. Karp, M. Starast, and T. Paal (2010) The Effect of Mulching and Pruning on the Vegetative Growth and Yield of the Half-High Blueberry. *Agronomy Research* 8:1, 759–769.

Baksh, K., W. Akram, M. A. Raza, and I. Hassan (2004) Determination of Factors Affecting Cauliflower Yield in Punjab, Pakistan. *International Journal of Agriculture and Biology* 6, 1056–1058.

Balochistan, Government of (2010) *Development Statistics of Balochistan*. Quetta: Bureau of Statistics, Planning and Development Department.

Bathan, B. M. and F. A. Lantican (2010) Factors Affecting Yield Performance of Banana Farms in Oriental Mindoro, Philippines. *J.ISSAAS* 16:1, 110–120.

Bengali, K. (2009) Water Management Under Constraints: The Need for a Paradigm Shift. ln M. Kugelman and R. M. Hathaway (eds.) *Running on Empty: Pakistan's Water Crisis*. Washington, DC: Woodrow Wilson International Centre for Scholars.

Blanchard, O. J. (1967) Comment. *Journal of Business and Economic Statistics* 5, 449–451.

Bodunov, M. V. (2006) *The Derived Importance of Attributes and the Problem of Collinearity*. Ipsos Russia.

Cameos, SPRM, Halcrow, and ADB (2008) Effectiveness of Delay Action/ Storage Dams in Balochistan: Irrigation and Power Department, Government of Balochistan; Royal Netherlands Government. Final Report, TA 4560-PAK.

Khair, S. M., A. Ali, and A. Wadhayo (2002) Apple Production Practices and Constraints in Northern Balochistan. *Socioeconomic Research Studies 2002-2003*. PARC, Islamabad. pp. 1–17.

Kiani, A. K. (2008) Farm Size and Productivity in Pakistan. *European Journal of Social Sciences* 7:2, 42–52.

Malte, Reimers and Stephan Klasen (2011) Revisiting the Role of Education for Agricultural Productivity*:* Poverty, Equity and Growth. Courant Research Centre. (Discussion Paper).

Pakistan, Government of (2011) *Pakistan Economic Survey (2010-2011).* Islamabad: Ministry of Finance, Economic Advisors Wing.

Reimers, M. and S. Klasen (2011) Revisiting the Role of Education for Agricultural Productivity. Courant Research Centre, University of Gottingen. (Discussion Paper).

World Commission on Dams (WCD) (2000) *Dams and Development: A New Framework for Decision-making*. London and Sterling, VA: Earthern Publications Ltd.