The Impact of Irrigation on Household Assets[1]

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KEY MESSAGES

- There is no evidence to show that households with access to irrigated plots have more durable assets, livestock, farm equipment, cows and buffalo, or pull/plough animals than households with no access to irrigated plots.

- Human capital contributes greatly to the accumulation of durable assets.

- Household size is positively associated with the number of livestock, cows and buffalo and pull/plough animals. But the number of these assets is likely to decline if the total number of household members exceeded seven to eight.

THE PROBLEM

The government of Cambodia has acknowledged that a well-functioning physical infrastructure is a pre-requisite for the national goal of achieving sustainable economic development, growth and poverty reduction. For this reason, further rehabilitation and construction of physical infrastructure is defined as one of the most important components to reaching said national goal (RGC 2009). In 2006-2008, the Ministry of Water Resources and Meteorology (MOWRAM) undertook 144 irrigation projects to provide irrigation water to 267,224 hectares (RGC 2009). The government will continue over the next few years to prioritise the rehabilitation, maintenance, construction and efficient management of irrigation infrastructure in order to boost agricultural production. It aims to enhance the efficient management of the irrigation systems by introducing the Participatory Irrigation Management and Development policy and establishing Farmer Water User Communities.

Irrigation generates various benefits which can contribute to poverty reduction and economic growth (e.g. Dillon 2011; Hussain 2007; Hussain & Hanjra 2004). However, the extent to which this is true has not been extensively tested. This knowledge gap hampers government and non-government organisations from making informed and best choices for investments in irrigation infrastructure so as to achieve the greatest marginal benefit towards meeting the government's economic and social goals. The literature review for this study suggests that there are as yet no studies which have empirically examined the impacts of irrigation

Table 1: Household Assets by Irrigation Status

	Non-irrigation	Irrigation <=50%	Irrigation >50%	ANOVA		Total
				F Statistic	Significance level	
Number of households	17	61	142			220
Durable asset index						
2008	-0.56	0.07	0.07	1.15	0.317	0.02
2010	-0.27	0.22	0.18	0.64	0.526	0.16
Livestock index						
2008	-0.32	-0.22	0.11	2.81	0.062	-0.01
2010	-0.68	-0.47	-0.45	0.92	0.401	-0.48
Farm equipment index						
2008	-0.34	0.05	0.00	0.59	0.553	-0.01
2010	-0.16	0.09	0.08	0.27	0.760	0.07
Cows and buffalo						
2008	3.35	3.54	3.82	0.37	0.688	3.70
2010	2.94	3.38	3.08	0.34	0.710	3.15
Pull/plough animals						
2008	1.59	1.56	1.89	0.70	0.499	1.77
2010	1.59	1.20	1.27	0.74	0.477	1.28

on household socio-economic status based on such indicators as asset accumulation, income, nutrition, health and poverty in Cambodia. This study attempts to measure the effects of irrigation on the numbers of household assets such as durable assets (e.g. motor-bike, bicycle, TV), farm equipment (e.g. tractor, water pump, threshers), cows and buffalo and pull/plough animals[4].

THE CASE STUDY

This policy brief presents some of the key findings of the household surveys conducted by CDRI under the Water Resource Management Research Capacity Development Programme (WRMRCDP)[5] in 10 irrigation schemes located in three provinces (Kampong Chhnang, Kampong Thom and Pursat) in the Tonle Sap Basin during 2008-2010. Thirty households from each scheme were randomly selected for baseline interviews to capture information on household characteristics, household enterprise, residential and agricultural land characteristics, livestock[6] and other capital assets. Follow-up surveys included interviews with 235 households during the 2008 and 2009 wet seasons and 220 households in the 2008 and 2009 dry seasons. Furthermore, a second base line survey was conducted in August 2010 to update data regarding household characteristics, livestock and other capital assets.

4   Pull/plough is a subset of total number of cow and buffalo owned by household used particularly for farming activities.
5   WRMRCDP consists of three components: physical, governance and economic (CDRI 2010)
6   Livestock is broadly used to include beef cattle, breeding bulls, pigs, chickens, ducks and other poultry.

Different studies define different irrigation variables, for example, in terms of availability of irrigation at plot level, surface and groundwater irrigation and area of irrigated land per person (Wokker *et al.* forthcoming; Huang *et al.* 2006, Zhou *et al.* 2009). For the purpose of this study, the irrigation variable was defined as the proportion of irrigated plots to total plots per household. Given this definition of the irrigation variable and the objective of the study, the total sample population data used in the analysis was reduced to 220 households.

KEY FINDINGS

The descriptive analysis of the survey data revealed that durable assets and farm equipment increased over the study period of 2008-2010, while livestock, cow and buffalo, and pull/ plough animal numbers declined in all household groups (i.e. non-irrigation, irrigation less than 50 percent and irrigation more than 50 percent) (Figure 1).

The decrease in livestock and cow/ buffalo numbers for households with more than 50 percent irrigated plots was greater than for households with no irrigated plots. In contrast, the increase of durable assets and farm equipment for households with no irrigated plots was greater than for households with irrigated plots. The number of pull/plough animals of households with less than 50 percent irrigated plots and those with more than 50 percent irrigated plots declined sharply, while numbers remained constant for households with non-irrigated plots.

Although the average value of each asset differed among the three household groups (based on area of irrigated plots), the analysis of variance (ANOVA), which determines whether or not there is a statistically significant difference between the means of several groups, indicated that there was no statistically significant difference in means for all assets in both years, except for livestock numbers in 2008.

It is worth noting that descriptive statistics only reveal a simple correlation between irrigation and household assets, but the underlying relationship may be concealed by
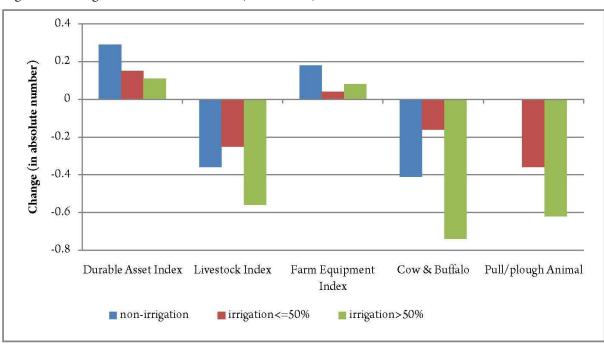
Figure 1: Changes in Household Assets (2008-2010)

the relationship between household assets and other confounding factors such as better economic opportunities and/or household characteristics. To address the weaknesses of the descriptive analysis, an econometric method was applied.[7] The result showed that:

- Access to greater irrigated plot areas has no significant positive impact on accumulation of household assets;
- Human capital contributes greatly to durable assets accumulation;
- Household size is positively associated with the number of livestock, cows and buffalo and pull/plough animals. But those assets are likely to decline if the total number of household members exceeded seven to eight.

POLICY IMPLICATIONS

The key policy implications arising from the current study are that:

- More attention should be given to balancing improvement of irrigation efficiency, specifically ensuring the availability of water in both wet and dry seasons, the equitable water allocation as well as establishment of appropriate water levels in cultivated plots, and expansion of the coverage of irrigation systems.
- A combination of increased investment in human capital and infrastructure is likely to have a strong impact on improving livelihoods, socio-economic status and accumulation of household assets than investment in infrastructure alone.

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7   Ordinary Least Squared (OLS), Two Stage Least Squared (TSLS), and Limited Information Maximum Livelihood (LIML) method were adopted.