

Growth and Development**Identifying the Role of Education in Socio-Economic Development¹****Francesco Burchi**

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Food insecurity and illiteracy involve more than **800 million** people today. In the proposed paper, I argue that education is a fundamental factor in achieving food security for rural populations in developing countries. I base my arguments on the Human Development Approach, according to which, education is both intrinsically and instrumentally relevant for education. In this paper I focus on the instrumental role of education for food security, by posing the question: *Is education, both basic and higher, an essential tool to fight against food insecurity in the rural areas of developing countries?*

I answer this question by examining the theoretical and empirical causalities between the two variables: education and food security.

Traditional Economic theories developed since the 1960s within the endogenous growth theory promoted the concept of *human capital*, according to which education is considered as a means to ensure economic growth. On the contrary, following Amartya Sen's *human development* paradigm, I argue that education can play an instrumental role in two different ways: through *economic production* and through *social change*.

While there is a literature, albeit short, on the contribution of education on development, this does not occur for food security. In this paper I argue that especially basic education, and not training or vocational education, can improve the capacity of individuals to live a decent life and to escape from the hunger trap. The basic idea is that being educated improves rural people's capacity to diversify assets and activities, to access information on health and sanitation, to enhance human agency in addition to increasing productivity in the agricultural sector; these are all essential elements to ensure food security in the long-run.

The theoretical study is, then, accompanied by an empirical analysis. Based on data taken by the *Demographic and Health Survey*, I construct a *cross-section* model, aiming to show the impact of education on "household food insecurity". Both variables concerning basic and higher education are included to show the best predictors. Food insecurity is, instead, measured by an aggregate indicator, chosen according to available data and theoretical foundations. The model focuses first on rural areas, usually the most disadvantaged by national educational policies, and then on total countries, in order to explain the difference between urban and rural areas, defined *urban bias*.

My aim is to prove that basic education has a good (negative) explanatory capacity of food insecurity. Moreover I seek to specify if higher education gives a statistically significant contribution or not, although probably lower than basic education variables.

As a conclusion, the policy implications of my study are the following. I argue that education is both theoretically and empirically proven to be relevant in fighting food

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insecurity and, therefore, governments and donors aiming to tackle these problems should focus their attention to this sector. Such a policy, indeed, should be made with a specific emphasis on rural areas and keeping in mind the multiple-advantages provided by an educated and skilled society.

Introduction

In this paper, I argue that basic education is a fundamental factor in achieving food security for rural populations in developing countries. For such a purpose, I use a methodology both theoretical and empirical. The paper is structured in the following way: in section one, I examine the characteristics and the limits of the Human Capital theory; in the second part, following the Human Development Approach proposed by Amartya Sen and other scholars, I argue that one of the most valuable ends of development for developing countries is the reduction of food insecurity; in section three, I propose a theoretical model which analyzes the instrumental role of education in promoting food security in rural areas; in part four, I construct a cross-section model to explain the quantitative contribution of education in fighting food insecurity and compare this outcome between rural and urban areas; finally, based on previous arguments and results, I draw my conclusions.

Human Capital and Productivity

Theodore W. Schultz (1961) and Gary S. Becker (1962) have been the main advocates of human capital as a determinant of economic growth. Starting from the analysis of economic growth in several countries, Schultz identified the accumulation of human capital as the main factor explaining the difference between growth and accumulation of physical capital. According to him, human capital is a capital good whose value depends on five main categories of investments in human beings: 1) health, including also nutrition, 2) migration, enhancing job opportunities, 3) on-the-job training, 4) formal education, 5) study programs for adults, such as extension services in agriculture. However, most of the empirical studies within the endogenous growth theory operationalize the concept of human capital focusing on its educational component. The same occurs within studies that address the problem of agricultural productivity in rural areas of developing countries (Jamison, Lau, and Lockheed 1982; T.P. Schultz, 2005; Koffio-Tessio et.al.2005). Jamison, Lau and Lockheed, on the basis of the results derived from 18 studies conducted in several geographical areas, examined the contribution of education to agricultural development. Taking as a proxy of agricultural development the variation of productivity in this sector, the authors concluded that completing the first four years of formal schooling result in a 7.4% increase of agricultural productivity (Jamison, Lau, and Lockheed 1982, 54). Most of the critics of this approach remain in the same line of thought (Phillips 1987), proposing merely different ways to measure agricultural productivity or a wider idea of efficiency.

Heterodox Critics to Human Capital and Economic Resources

The implicit assumption behind the human capital theory is that the achievement of economic resources (total or per capita), or economic development in a dynamic version, is the final goal and that education is an input that, together with physical (and social) capital, contributes to the increase of these resources. Heterodox critics, founded on principles wider than strictly economic ones, challenge this theoretical construction.

According to the Human Development Approach (HDA), proposed by Amartya Sen, Martha Nussbaum, and Paul Patrick Streeten, **economic resources** are important only if people are finally able to convert them into something valuable by itself. "People value commodities...not in their own right but for their characteristics and for the needs they meet" (Streeten 2003, 76). These authors criticize the vision of development for being purely economic, readdress it as a process of enlarging people's choice to live a life they value (UNDP 1990, 10), through an increase of valuable human freedoms (Sen 2003). In this

context, income and other economic resources are an “intermediate goal” (Sen 2003, 3) and important instruments to promote development, but they are neither necessary nor sufficient to enlarge people’s freedoms. Therefore, new ends of development should be identified: among others, the supporters of the HDA focus on having a long and healthy life, being adequately nourished, and being educated.

The second type of criticism, strictly connected to the first, concerns the value attributed to education within the human capital framework. Based on Sen’s work (1997, 1959), I argue that education has a double role for development. First, a “direct” (or intrinsic) one because being educated allows people to have directly a better quality of life by enjoying, for instance, cultural events. Second, an “indirect” (or instrumental) one realized through “economic production”, and through “social change” (Sen 1997, 1960). This definition outlines the limits of the human capital theory, which just looks at one of a broader range of “life- skills” provided by education (Hoffmann et al. 2004).

Albeit different, human capital and life-skills are mutually dependent. The three human capital categories suggested by Lanzi: *basic skills* (reading, writing), *professional competencies* (applied knowledge, technical skills), and *complex functionalities* (problem solving ability, selflearning skills) affect human freedoms, and *vice versa* (Lanzi 2004, 5-6). For instance, professional competencies increase human capital determining, *ceteris paribus*, higher productivity and income, but it has also a capacity to enlarge human freedom because obtaining a better job can raise the level of personal satisfaction, which determines a better quality of life.

Education and Food Insecurity

Following the previous critics, I start with the assumption that it is not economic growth the final goal of development, but there are other valuable ends, among which I study **food security**. The reason for this choice is that especially in developing countries, where a large part of the population faces constant deprivations, as Sen claims, income is not a good indicator of the quality of life; the consistent elements of life include “being adequately nourished” (Sen 2003, 5). That is, food security analyzed at household level, which reflects the “sustainable access to safe food of sufficient quality and quantity...to ensure adequate intake and healthy life for all members of the family” (UNICEF 1998, 23-25). Analogous to the argument that Sen (1998, 2-5) uses to promote the value of longevity, I consider the value of freedom from starvation and hunger as a desire widely shared among people for its intrinsic value and for its capacity to promote other freedoms. Indeed, not being well-nourished affects the capacity of people to work, to participate in community life, to be respected, to concentrate in school, thus this problem should be urgently addressed. Furthermore, 70% of world poor live in rural areas (World Bank 2003); therefore I propose a theoretical model which stresses the instrumental role played by basic and higher education in tackling food insecurity among rural people.

Here, using different kinds of literature as a reference, I identify the multiple mechanisms through which an educated person is more likely to be food secure. First, the impact of education can occur through *social change*.

As Mukudi (2003) claims, education has a key role in accessing public *information*, especially concerning health, nutrition, and hygiene. Acquiring knowledge about how to avoid and face illnesses is essential since people with diseases require more calories to be food secure. Furthermore, people need to have, where possible, a proper and diversified diet in order to build a stronger immune system and avoid morbidity and mortality. Finally, even following right hygienic practices is essential to prevent diseases like diarrhoea. Mass Media such as radios are widely spread in African countries, even among poor people living

in rural areas; therefore only people with a minimum level of education can properly capture and elaborate that information². Even more relevant is the role of basic education, i.e. literacy, in acquiring this type of information from written messages. This argument, indeed, should be extended in an inter-temporal dimension: “parental education...has been found to invariably influence nutritional outcomes of the children. Children of less educated parents and those of parents with no educational exposure consistently score poorly on nutritional status indices” (Mukudi 2003, 246). Moreover, there is a gender aspect that does matter for ensuring long-term food security. In fact, the specific impact of women’s education is higher: girls who attend school and obtain at least the basic skills can even teach right health and hygienic practices to their children once they become mothers. This means that female education should be at the centre of the analysis because it has an additional direct effect on nutritional status. Schnell-Anzola, Rowe and LeVine (2005) take as a reference an empirical research carried out by Glewwe in Morocco, which showed that maternal “education improves child health primarily by increasing health knowledge” (Glewwe 1997, 151) and that it does not depend prevalently on the subjects studied in class, but on the very general abilities to read, write, reflect, and process information.

Education, then, is fundamental to promote *agency*, which expresses the capacity of rural poor to escape from poverty and hunger with their own power. Who is educated is more likely to find a job, but has also, *ceteris paribus*, a capacity to use more rationally the resources he or she owns. Educated and informed people have more probability to select valuable objectives in life, such as having stable access to food for their household. Even in this argument, there is a gender factor. Mothers showed to assign a higher value to the well-being of their children, allocating more resources to health, and nutrition (Sen 1999, 195-196). Quoting still Sen (1999, 197), “female literacy...is found to have an unambiguous and statistically significant reducing impact on underfive mortality, even after controlling for male literacy.” Therefore, a more active role of women in family is likely to lead to lower mortality rates, which, in developing countries, are mostly due to malnutrition.

A third “social” benefit of education for food security and well-being in general, is enhanced through an improvement of *social relations*. In African rural regions, for instance, the role that community actions can play is impressive. Some authors defined “social capital” (Woolcock and Narayan 2000) the social networks in which a person is included, arguing that the larger these nets the larger the possibility to find assistance in emergency situations. To make an example, man communities organize common meals, systems for a common access to credit, labour division, and public participation to ceremony expenditures. This way the risk, even to become food insecure, is alleviated, making individuals less vulnerable. The next question is: how does education affect social relations? Lanzi (2004, 13) speaks about the “positional” value of education, with reference to the ability to relate well to others and to cooperate (OECD 2003) achieved through education, even here conceived in its more general form rather than the specific topics studied in school.

Finally, education provides a *psychological* contribution to food security, making people more ambitious and self-confident. Being educated is considered a relevant weapon against feelings like shame and lack of hope, whose overcoming is indispensable to promote food security through the other mechanisms mentioned above.

The second channel through which education influences food security is “economic production”. In rural areas, this is typically achieved through the increase of agricultural productivity and efficiency in that sector. However, another economic contribution of

² See, for instance, Schnell-Anzola, Rowe and LeVine (2005, 20-21) drawing this conclusion from an empirical study made by D. Thomas in 1999.

education to food security was neglected: the income obtained by crops different from the main one and nonfarm activities. Rural non-farm activities were not taken into adequate consideration; instead, they can be a fundamental direct source of food or income, and, even more, a resource for the long-run. In fact, the diversification of income generating activities is essential to reduce vulnerability and recover more rapidly from emergencies like natural disasters. The various contributions of education to food security can be viewed in the diagram (appendix 1), which is a slightly modified version of the UNICEF model of the causes of malnutrition (1998, 24), and of its revision made by Mukudi (2003, 247).

A Quantitative Assessment

The objective of this quantitative analysis is to acquire evidence of the contribution given by education for rural people to food security. Based on data collected through the *Measure Demographic and Health Surveys Program*³, first I examine the correlation between education (basic, advanced and higher) and food insecurity, and then I apply a cross-section model on aggregated survey data for the rural areas of 48 developing countries⁴. Education is expressed by school attendance rates while household food insecurity by an indicator composed of three dimensions with the same weight: one component expressing the “adequate survival status” (Wiesmann 2002), which is measured by mortality rates among rural children; a second component that reflects the idea of both “adequate nutritional status” and “food adequacy”, through a measure of nutritional status of rural children; a third component that concerns “female malnutrition”, expressed by the percentage of rural women whose body mass index is less than an internationally fixed threshold. This type of indicator is defined as an “outcome” indicator (Maxwell and Frankenberger 1992, 96) and well reflects the idea of food insecurity expressed in the previous section. In fact, “being adequately nourished” cannot depend only on food owned and money to buy that food because peoples’ capacity to convert these commodities into effective access to adequate food varies according to age, gender, and metabolism (Sen 2003, 7). Instead, an indicator based on nutritional and survival data incorporates such diversity, since the individual outcome responds to personal characteristics.

As a first step, I carried out the correlation analysis. In the two tables below, I report the outcome of Pearson’s and Spearman’s correlation coefficients, divided according to the type of educational variable included: attendance rate for group of students of different ages, or maximum level of education attended.

Tab. 1 Pearson’s and Spearman’s correlation coefficients *school attendance-HFI1*

Coefficient	rurattendance610	rurattendance1115	rurattendance1620	rurattendance2124
Pearson	-0.7705	-0.6443	-0.4574	-0.1820 ***
Spearman	-0.7883	-0.6430	-0.4537	-0.2359 ***

Tab. 2 Pearson’s and Spearman’s correlation coefficients *educational level-HFI1*

Coefficient	rurnoedu	rurminsecondary	rurhigher
Pearson	0.7178	-0.5587	-0.5478
Spearman	0.7131	-0.7158	-0.7101

*** Not significant at 10% significance level

³ The main source is the ORC Macro: data available online at the website <http://www.measuredhs.com/aboutdhs/>

⁴ One observation for each country, referred to the period 1995-2004. To see the list of variables included in the analysis, see Appendix 2.

Both the tables show a very high linear correlation between food insecurity and “basic education”, so as measured by *rurattendance* and the inverse of *rurnoedu*. This correlation decreases for “advanced education” (*rurattendance1115* and *rurminsecondary*) and, finally, is lower or even statistically not significant for “higher education”. Such a statement is coherent with the idea that food security is a *basic* element of life for rural people of developing countries, which, therefore, is explained better by the access to *basic* education. The result does not change much if I examine the Spearman’s rho: the only exceptions are *rurminsecondary* and *rurhigher* whose coefficient is larger than Pearson’s rho (tab. 2). This means that these two variables are well correlated to *rurHFII*, but such a relation cannot be properly explained by a line.

The following step is the construction of the econometric model specific for rural areas. The aim is to assess the quantitative impact of education on food insecurity, controlling for other, non economic, variables which reflect important aspects like access to drinkable water, hygiene, and access to information. Variables related to income, expenditure and ownership of assets are not included due to the lack of data. I proceed running an initial model encompassing all the variables, then, through the step-wise option of Stata Software, I obtain the final model with only significant variables. Here below I report the results of the model.

Model 1: Determinants of food insecurity in rural areas

Dependent variable: rurHFII	Coefficient	Standard Error
constant	19.82032	5.307448
rurfertility	0.6297012	0.1989238
rurattendance610	-0.1933505	0.0399088
rurnofacility	0.1177583	0.0273826
R-squared	0.777	

The first issue to address concerns its statistical validity. This model has all the main statistical properties and even the value of R Squared (0.777) is high in absolute terms. Moreover, I can reasonably sustain that the eventual addition of one or two variables linked to economic conditions of the households would make it close to the unit. Finally, I argue that these economic variables would not take large information now captured by education, leading to a general acceptance of the outcome of this analysis.

Then, I explore the theoretical implications of this model. The best predictors of household food insecurity in rural areas the following:

1. *Fertility*, which gives a very high positive contribution to the level of food insecurity. This is normal because the more children are in a family, the more problems occur in accessing food for all (See Sen 1999, 198-199; Nussbaum 2003, 335; Streeten 1997, 17-20)

2. *School attendance* of children between the age of 6 and 10, which is the second best predictor.

3. *Lack of Access to toilet facility*, as a proxy of hygienic conditions, which gives still a satisfactory contribution to food insecurity.

Given the objective of this analysis, I focus on educational variables. The results are coherent with the theoretical framework and with the correlation analysis: the educational level which affects the most food security is a basic one. This variable has a very high statistical significance (p-value = 0.000), while all the other variables related to education were excluded by the software. Concluding from this model, I argue that basic education has a good explanatory capacity of the phenomenon food insecurity and, more precisely, that an investment aiming at increasing children’s school attendance rate by 100% can reduce food insecurity by approximately 19%.

Finally, I aim to compare the model applied to rural data with another applied to urban ones. Since both the deprivations: lack of education and food insecurity are much more dominant in rural areas, I examine if there are relevant differences in the factors affecting urban household food insecurity. Therefore, I first run both the models, and then I calculate the Chow test to check if there is a structural change between the two areas. The value of the Chow Test is the following: **Chow Test = 3.826**, which marks a structural change at both significance levels: 0.05 and 0.1. Second, after introducing a dummy variable: *gurban*, which takes value 0 for rural areas and value 1 for urban areas, I run the total model. Here below I report the results.

Model 2: Determinants of food insecurity: a rural-urban comparison

Dependent variable: pooledHFI1	Coefficient	Standard Error
constant	19.82032	5.061994
<i>gurban</i>	-2.446154	7.848573 ^{***}
<i>pooledfertility</i>	0.6297013	0.189724
<i>durbfertility</i>	0.1055643	0.289663 ^{***}
<i>poolednofacility</i>	0.1177583	0.026116
<i>durnofacility</i>	0.1704578	0.060800
<i>pooledattendance610</i>	-0.1933505	0.038063
<i>durbpooledattendance610</i>	0.0244451	0.065811 ^{***}
R-squared	0.7798	

*** Not significant at 10% significance level

The structural change depends on the diverse impact of *poolednofacility* in the two areas: the impact is much larger in urban areas as testified by the “variable” *durnofacility* that is the only variable showing a geographical difference which is statistically significant. For the other two independent variables, a difference exists but it is not statistically significant. As a conclusion of this analysis, I argue that the impact of basic education on food insecurity is approximately the same in urban and rural regions, while the general weight of the other explanatory variables varies. Furthermore, the R-Squared for the urban model is lower (0.70 versus 0.77), which is likely to outline a larger relevance of economic factors in these areas.

Conclusions

As a conclusion, I argue that education is both theoretically and empirically proven to be relevant in fighting food insecurity and promoting development. It was demonstrated that an increase of children's school attendance rate by 100% can reduce food insecurity by approximately 19%. Therefore, Governments and donors aiming to tackle these problems should focus their attention (and investments) on this sector.

The new perspective, here adopted, is that the contribution of an educated society goes beyond the economic growth of a country, and does affect positively the life of people, especially that of the least advantaged. Both the approaches stress the importance of investments in education, but, in my view, the Human Development Approach gives an additional justification for investing in basic education. Finally, although the comparative analysis does not emphasize regional differences, such a policy should be adopted with a specific emphasis on rural areas because of the dramatic incidence of illiteracy, food insecurity, and mortality in these places.

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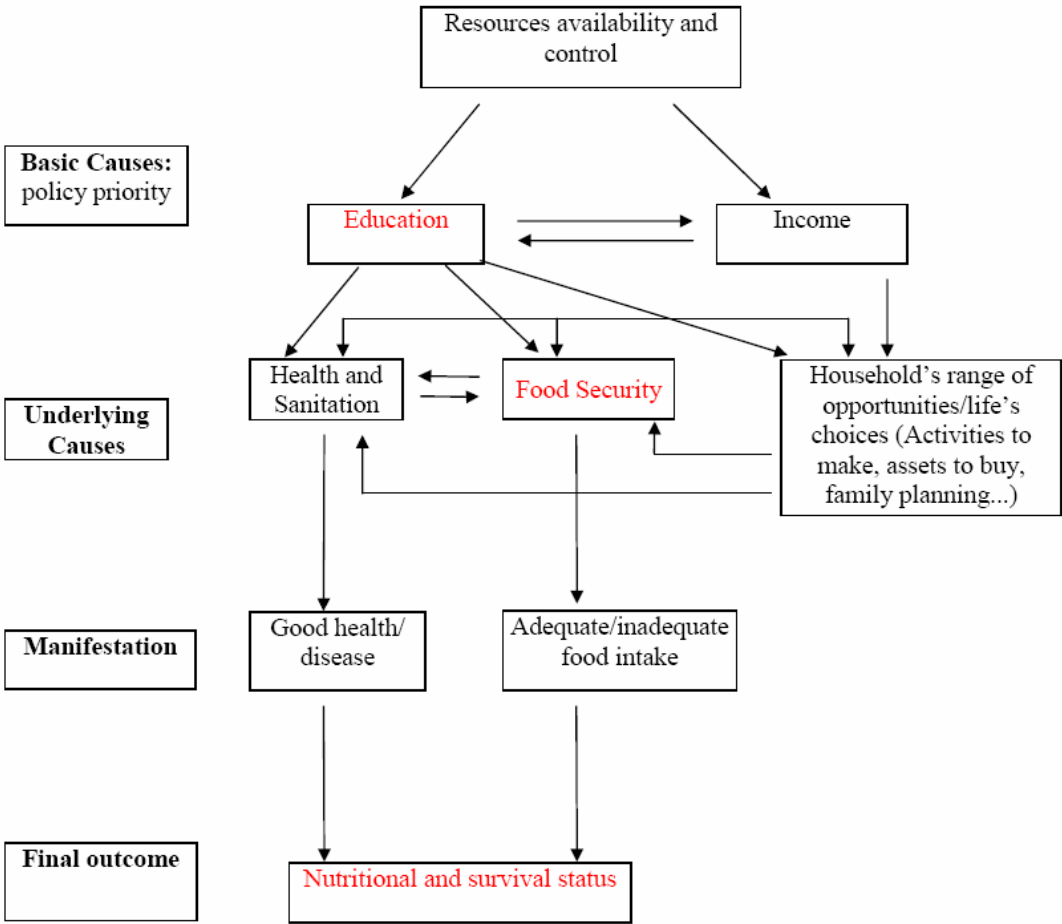
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APPENDIX 1

Diagram: linkages Education – Food Security – Nutrition



APPENDIX 2

Variables and indicators

The variables originally considered are several: below I report the list only of those concerning rural areas and divide them according to the macro-distinction between educational, household food security, and other data.

Rural Education:

1) Rural school attendance

rurattendance610	rural children 6-10 attendance rate (%)
rurattendance1115	rural children 11-15 attendance rate (%)
rurattendance1620	rural children 16-20 attendance rate (%)
rurattendance2124	rural children 21-24 attendance rate (%)

2) Educational level of rural population

rurnoedu	% of rural people with no education attended
rurminsecondary	% of rural people with either secondary or higher educational level attended
rurhigher	% of rural people with higher education attended

The variables included in these two groups are used as proxies of the following phenomena:

- 1) **Basic Education:** expressed by 6-10 and 6-15 school attendance and by the percentage of rural people who attended primary education or with no education (lack of basic education in the last case).
- 2) **Advanced Education:** 11-15 school attendance and the percentage of students with at least secondary education attended.
- 3) **Higher Education:** 16-20 and 21-24 school attendance and the percentage of students who have attended higher education.

Rural Household Food Security:

rurinfantmortality	rural infant mortality rate (%)
rurund5mortality	rural under-5 mortality rate (%)
rursevstg	rural severe stunting rate % (-3sd)
rurmodstg	rural moderate stunting rate % (-2sd)
rursevwstg	rural severe wasting rate % (-3sd)
rurmodwstg	rural moderate wasting rate % (-2sd)

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rursevundwght	rural severe underweight rate % (-3sd)
rurmodundwght	rural moderate underweight rate % (-2sd)
rurlowbmi	percentage of rural women whose BMI is lower than 18.5 cm

The final indicator of rural household food insecurity (rurHFI1) is expressed by the following equation:

$$\text{rurHFI1} = 1/3 * [[2/3 * \text{rurmodstg} + 1/3 * \text{rursevstg}] + [[2/3 * \text{rurmodwstg} + 1/3 * \text{rursevwstg}] + [[2/3 * \text{rurmodundwght} + 1/3 * \text{rursevundwght}]] + [1/3 * \text{rurlowbmi} + 1/3 * [[1/2 * \text{rurund5mortality} + [1/2 * \text{rurinfantmortality}]]]$$

Other Variables:

rurradio	% of rural people with access to radio
rurfertility	rural fertility rate (%)
rurwater	% of rural people with access to drinkable water
rurhealth	% of rural people with diarrhoea disease
runofacility	% of rural people without toilet facility