Disease Control, Demographic Change and Institutional Development in Africa*

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Abstract
This paper addresses the role of tropical disease in rural demography, land use rights and public amenities, using data from Onchocerciasis (river blindness) control in Burkina Faso. We combine a new survey of village elders with historical census data for 1975-2006 and geocoded maps of treatment under the regional Onchocerciasis Control Program (OCP). The OCP ran from 1975 to 2002, first spraying rivers to stop transmission and then distributing medicine to help those already infected. Controlling for time and village fixed effects, we find that villages in treated areas acquired larger populations and also had more cropland transactions, fewer permits required for cropland transactions, and more regulation of common property pasture and forest. Treated villages also acquired closer access to electricity and telephone service, markets, wells and primary schools, with no difference in several other variables. These results are consistent with both changes in productivity and effects of population size on public institutions.

Keywords: West Africa, Burkina Faso, Public Health, Land Rights, Rural Infrastructure.

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Introduction and Motivation

In 1974, the World Health Organization and numerous partners launched the Onchocerciasis Control Program in West Africa. The OCP extended across Côte d'Ivoire, Niger, Mali, Togo, Benin, and Ghana and was centered on Burkina Faso (then Upper Volta), where the disease had infected about 10 percent of the population. New infections occurred primarily among rural children south of the 13° parallel, through painful bites from the aptly named *Simulium damnosum* blackfly carrying the microfilarial larva of a parasitic worm, *Onchocerca volvulus*. Those infected experienced itching, disfigurement, and eventual blindness. The blackfly vector can reproduce only in the oxygenated waters of a river or stream, hence the common name of this disease -- river blindness – and the potential for intervention to have a large economic impact by facilitating settlement in otherwise productive river valleys.

To control the disease, starting in 1975 the OCP used helicopters to spray larvacide along rivers. The vector began to disappear by 1977, enabling people to move closer to rivers without fear of blackfly bites and new Onchocerciasis infections. The vector-control phase of OCP ended in 1989, after which the OCP focused on the distribution of ivermectin to control symptoms in those already infected. Ivermectin had been a veterinary deworming drug, which in the early 1980s was also shown to be effective in killing the microfilariae produced by *Onchocerca* in the human body. Adult worms are not affected, but ivermectin blocks their reproduction until they reach the end of their natural lifespan about 14 years after infection.

Distribution of ivermectin to help villagers with Onchocerciasis began in 1987. Annual doses successfully controlled symptoms of the disease and prevented further transmission of the *Onchocerca* parasite. The blackfly vector returned to the river valleys but the disease was no longer endemic and in 2002 the OCP ended, with ivermectin remaining in use against filarial parasites transmitted by other channels.

The OCP is widely recognized to have been one of the world's most successful public health projects (Levine 2007). Figure 1 illustrates the remarkable extent to which Onchocerciasis was brought under control across West Africa between 1975 and 2002, with near-eradication in

many places and continued endemicity only in Sierra Leone where the OCP was not active. How the OCP discovered and implemented their approach has been the subject of many studies in tropical medicine (e.g. Benton et al. 2002) and a widely read book in anthropology (McMillan 1995).

In this paper, we use OCP exposure and associated changes in village population to address the role of public health in local institutions' provision of agricultural property rights, public services and infrastructure. Disease control could influence local institutions directly by changing the productivity of labor, land and capital, and could also matter via its effects on rural population size and density. The role of population density was emphasized by Boserup (1965), who argued that a larger rural population creates new incentives for institutional change and collective action, in addition to new incentives for technological change as had been suggested by Hicks (1932). Boserup's hypothesis could operate through scale effects from population size, relative-price effects from factor scarcity, or both.

Modern analyses of how rural demography affects agricultural development were pioneered by Hayami and Ruttan (1971) for the U.S. and Japan, and tested in a large subsequent literature such as Johnston and Kilby (1975) and Olmstead and Rhode (1993). Only a few of these papers (e.g. Lin 1995) focus on the emergence and adoption of institutions; most ask how institutions affect technology adoption, such as Kazianga and Masters (2002, 2006). Focusing on rural demography also expands on our other previous work regarding the role of environmental factors in economic growth (Masters and McMillan 2001) and African policy choices (McMillan 2001, McMillan and Masters 2003).

Our focus on the specific challenge of *rural* population growth contrasts with most study of demography in development economics, which has focused either on demographic transition in the population as a whole (including the demographic "drag" or "dividend" from age structure emphasized by Bloom and Williamson, 1998), or the structural transformation from farm to nonfarm employment in terms of output and employment shares (including the "growth bonus" associated with shifting from a low productivity to a high productivity sector as in Temple, 2005). Focusing on demographic conditions within rural areas addresses Africa's distinctive history of post-independence agricultural decline, and grounds for optimism about the future as rural infrastructure and institutions adapt to higher levels of rural population density.

Studying how rural Burkina Faso responded to the OCP offers an opportunity to extend the broader literature on the economic effects of public health shocks (Acemoglu and Johnson 2007, Cutler et al. 2010, Bleakley 2007, Ashraf, Lester and Weil 2009) and demographic change more generally (Galor 2012, Galor and Weil 1999). Our study is made possible by the timing of Burkina Faso's decennial censuses in 1975 (before vector control) and 1985 (before deworming), then 1996 and 2006 (after the disease was fully controlled). We focus on OCP-related variation in village population, in land-use rights and various public amenities, as recalled by focus group interviews of village elders.

The closest antecedent to our study is probably Grimm and Klasen (2008), who test for endogenous adoption of land titles at the village level on Sulawesi in Indonesia. Our surveys include land rights and also consider a very wide range of other public institutions and infrastructure used for market exchange. Methodologically, our use of focus groups to obtain village-level recall data on the location and availability of public services and land rights follows Chattopadhyay and Duflo (2004), building on a long tradition of participatory surveys in rural areas (e.g. Chambers 1994). This approach allows us to ask about many different types of public services, infrastructure and property rights, as seen from the villagers' point of view.

One purpose of this paper is to test the value of villagers' recall data in establishing stylized facts about how the actions of public institutions vary across space and time. In future work, recall data of this type could also be used to analyze causal effects of public services, infrastructure and property rights on economic outcomes. For example, Besley (1995) found evidence that institutions significantly affect investment outcomes in rural Africa. Pande and Udry (2006) provide a summary of these studies. In Burkina Faso specifically, Kazianga and Masters (2002) found that stronger cropland tenure was associated with more intensive soil and water conservation.

In the next section, we describe how OCP treatment affected rural Burkina Faso, before turning to our own empirical strategy, data and results.

Onchocerciasis Control and Population Movements in Burkina Faso

River blindness is spread through bites from a blackfly that reproduces in rivers and subsists on human blood, transmitting the filarial larvae of a parasitic worm. These larvae

develop into adult worms inside the body, forming nodules typically around the waist area, where they live for about 14 years and produce millions of microfilariae that move to and damage the victim's skin and eyes. The microfilariae themselves have a lifespan of up to two years in the human body, during which time they may be ingested by another blackfly, hosted for 6-8 days and transmitted to another person.

The blackfly can reproduce only in rivers and streams, from which they fly for many miles to take human blood meals. When the human population in that vicinity is sufficiently dense, these blackfly bites are painful but no transmission occurs because the fraction of blood meals containing microfilariae is too low to sustain the Onchocerca population. When humans are present in population in the blackfly at lower density, the disease becomes hyper-endemic. Children will become infected soon after they begin to move outside the home, skin disfiguration occurs in the late teens, and eyesight deteriorates in adulthood. When transmission through the blackfly is interrupted, those infected become cured when the adult worms eventually die, and their symptoms can be relieved in the meantime by treatment with ivermectin.

In the southern parts of Burkina Faso where blackflies could carry Onchocerciasis, only a small fraction of locations had a sufficiently high human population density to prevent transmission before the OCP began. An analysis of the country's 1975 census suggested that high densities would have protected people around the capital city, Ouagadougou, and along the 150 km from there northwest to Ouahigouya and southeast down to the Nazinon Valley on the border with Ghana. Soon after spraying started in 1975, people responded by moving closer to the newly attractive river valleys, expanding existing villages and also starting new ones. Some of this movement was spontaneously undertaken by individuals, and some of it occurred through planning in villages targeted for settlement by a government agency, the *Autorité des Aménagements des Vallées des Volta* (AVV).

The demographic changes that followed immediately after OCP intervention are illustrated in Figure 2, showing population growth rates for 1975-1985 in our nationally representative sample of villages. The map shows the location of Burkina Faso's major rivers, with shading in the areas where pre-intervention surveys found the parasite to be endemic so OCP spraying occurred. Symbols for each village indicate its population growth rate between the 1975 and 1985 censuses, using triangles for villages in AVV areas, and dots for villages that

were not part of AVV planning. Visual inspection suggests clear differences in growth rates between villages in the shaded and non-shaded regions, with most villages in the treated areas experiencing ten-year population growth exceeding 75 percent, and most villages elsewhere experienced growth of less than 50 percent.

The pattern of migration in response to OCP spraying is described in detail by McMillan et al. (1992, 1993). Some of this occurred from the drier and higher-altitude northeast and central plateau into the Onchocerciasis zone, while some involved movement within the zone closer to rivers where blackfly bites had been more frequent, transmission rates faster and parasite loads heavier. Some settlement was linked to AVV planning and investments, but McMillan et al. (1993) estimate that more than 80 percent of the increase in cultivated land in Burkina's river basins could be attributed to spontaneous settlers outside of AVV influence.

Data Sources, Sample Selection and Descriptive Statistics

Our evidence on changes in village-level access to public services, infrastructure and property rights comes from a novel survey conducted for this project by the Burkina Faso Office of Agricultural Statistics in January through June 2010. This survey asked groups of village elders to discuss and describe the history of various amenities used by their villagers, recording the year in which any changes occurred. From those underlying observations, we construct time-varying indicators of villagers' property rights over land and their proximity to each kind of public service or infrastructure. We combine these measures with geocoded data on the boundaries of OCP treatment and AVV planning areas, plus population estimates for each village from the four national censuses of 1975, 1985, 1996, and 2006, to estimate the impact of exposure to treatment on village population size, property rights and local institutions' provision of public services and infrastructure.

The actual questionnaire for the group interviews is reproduced in an online appendix. The survey was administered by experienced enumerators employed for the country's annual agricultural survey. For our interviews, enumerators assembled a focus group of village leaders and asked about various types of property rights and public services available around their village. For each amenity, we asked the group how far villagers currently travel to reach the nearest point of service and when that amenity became available at that location; how far they

had to travel for that in earlier years and when it became available there; and again how far the amenity had been from the village before that and when it became available there. The result was a maximum of three step-changes in the distance to key public goods and services. The section on property rights did the same for institutions, for example by posing the following question: Do cropland transactions (rental, sales or loans) occur in your village? If the group agrees that the answer to this question is yes, the interviewer then asks: since when have cropland transactions occurred? Questions posed in this way allow us to construct time varying indicators from the point of view of the villagers themselves. We deliberately did not provide any anchor dates, or explain that our analysis of the distances they report would be correlated with village populations in census years, or correlated with Onchocerciasis treatment status.

Our questionnaire asked for current and historical distances to a total of 32 different kinds of public goods, services and markets, and for current and historical indicators of 18 different indicators of property rights over agricultural land use. Questions were pre-tested by the Ministry of Agriculture enumerators, and terminology was back-translated to ensure correspondence between economic concepts and local usage. For example, in asking about property rights over pasture and the gradual enclosure of grazing areas, we constructed a categorical variable classifying ownership as being vested in an individual, as opposed to a family, a lineage, or a community. Our question about access to rural banking concerns the nearest *Caisse Populaire* branch. As expected, questions varied in the degree to which respondent groups were able to agree on an answer. In the end we retained data for 21 public amenities and 5 kinds of property rights which many village groups could recall back to 1975 or beyond.

The entire sample of farm households used by the Office of Agricultural Statistics for its nationally-representative surveys consists of 747 villages. Of these, we drop 118 villages because they are located in areas subject to AVV planning, where land use rights and public amenities are unlikely to be representative of the country as a whole. An additional 14 villages had to be dropped because of uncertainty in matching our survey villages to census data and OCP maps, due either to differences in village names as recorded in agricultural statistics and in the census, or to errors in recording GIS coordinates. Our final sample size is 615 villages, of which 60 percent are located in the Onchocerciasis-endemic areas that received treatment. Over three-fourths of the final sample (a total of 473 villages) had their population recorded in all four

census years. An additional 131 villages had their population recorded in three of the four years, and only 11 villages have population data for only two of the four years. Our preferred specification pools the data for all 615 villages in an unbalanced panel, so that our results are nationally representative of the average village observed in 2006 everywhere in the country outside of AVV planning zones. As a robustness test for internal validity we compare these results to those obtained using only the subset of 473 villages whose population data forms a balanced panel. Those results, available on request, are substantially identical to those shown here. Both parameter estimates and significance levels are very similar, and in almost all cases where significance differs the estimates are more precise when using the smaller balanced sample, but in any case the larger sample is preferred to avoid the reverse-attrition bias that would arise if we did not include villages formed after 1975, perhaps as a result of OCP treatment.

Descriptive statistics on all variables used in our final regressions are shown in Table 1, and differences at baseline between villages in treated and untreated areas are shown in Table 2. The first column of Table 1 shows average village populations to have grown from 1975 to 1986, then changed little in the decade from 1986 to 1996, and become smaller in 2006 with a much larger standard deviation. Differences between average village size and aggregate population growth could be due to migration and formation of new villages, and also the possibility of measurement error especially in the 2006 census. Regarding property rights, we find that land use arrangements became slightly more market oriented in each successive census year. For example, the share of observations in which cropland rights were assigned to individuals as opposed to families, lineages, communities (or remaining unassigned) rose from 38 percent in 1975 to almost 44 percent in 2006. The largest changes were for regulation of pasture and forest use, which rose from 23 to 43 percent and from 1 to 17 percent of villages respectively. The occurrence of land transactions and permit requirements prior to transactions both became slightly more widespread, from 85 to 89 and from 34 to 37 percent of villages respectively, but standard deviations are quite large relative to those trends.

Panel B of Table 1 shows descriptive statistics for public amenities. Most of these came to be provided increasingly close to villages, but the first column of Panel B shows villages' mean distance to the closest road to have risen from 3.79 km in 1975 to 4.91 km in 1996, before

dropping again in 2006. This could have been due either to new villages being formed far from existing roads, or old roads becoming impassable due to lack of maintenance, until accelerated road-building brought the average village back towards the proximity enjoyed in 1975. The amenity whose proximity changed the most is primary schools, whose mean distance from the village declined by an order of magnitude, from about 11 to about 1 km over the 1975-2006 period. Distances to secondary schools, health clinics, private shops and water wells or boreholes also declined sharply to a third of their 1975 value, while several others declined to about half. Average distances to the nearest livestock market and irrigation dam changed very little relative to standard deviations, which reveal wide variation across villages in their degree of remoteness.

Comparing the subsamples at baseline in Table 2, prior to disease control the villages in treated areas were considerably smaller than other villages, less likely to have individual rights over crop land and more likely to require permits for land transactions. They were farther from banking services, electricity or landline telephone service, public markets, livestock markets, dams and schools. None of the public amenities were closer to villages in OCP areas than in control areas. Our regressions ask whether disease control helped the Onchocerciasis-affected areas catch up and perhaps even surpass other parts of the country in village sizes, property rights and amenities. Comparing the subsamples at the end of our time period shows fewer significant differences: in 2006 there was no longer any significant difference between treated and control areas in village population, whether a permit was required for land transactions, or the distance to landline telephones, public markets or primary schools, and the differences in other variables declined in magnitude or statistical significance. Treatment appears to have helped the Onchocerciasis zone became more similar to the rest of the country, but that comparison is merely indicative and the 2006 differences are not reported here; to control for village fixed effects and include data from 1985 and 1996, we now turn to our regression results.

In our estimations, all regressions regarding questions about property rights use the full sample of 615 villages, since these questions had an unambiguous default response and no missing values were recorded. Sample sizes for public amenities are limited by whether village elders could agree on its' distance from the village. The distances known by almost all of our respondents were to the nearest primary school, health clinic and public market (sample sizes of 609, 602 and 601 villages respectively). At the other extreme, the smallest sample (only 290

villages) could agree on distance to the nearest irrigation dam. This pattern of response is consistent with a valid survey instrument, as there are relatively few irrigation dams in Burkina Faso and for most villages the question would have little salience to peoples' lives. Since the samples and associated non-response bias differ across the variables, we report results and sample sizes separately for each regression.

Identification Strategy

Our central hypothesis is that villages that had suffered endemic Onchocerciasis were initially smaller than other villages, and saw increased village population in response to OCP treatment. We hypothesize that this treatment exposure was then associated with institutional responses leading to more market-oriented property rights over agricultural land use and closer provision of public services, perhaps in response to the increase in village population. These hypotheses concern a nationally representative sample of all villages observed today, which combines changes in pre-existing villages with the characteristics of new villages formed after the OCP.

To identify a potentially causal effect of OCP treatment, we use a difference-in-difference approach to focus on changes over time in treated as opposed to non-treated areas. Figure 2 illustrates the approach by comparing rates of change in a nationally-representative sample of villages across the shaded as opposed to non-shaded regions. Our sample excludes villages in AVV areas (shown as triangles in Figure 2) since their property rights and public services were centrally planned and not the result of variance in local institutional development. Our sample includes new villages formed after 1975, perhaps in response to OCP treatment, with robustness tests for internal validity among the subsample that forms a balanced panel observed in all four national censuses.

The shaded area in Figure 2 corresponds to the part of the country affected by Onchocerciasis before the OCP began. The burden of disease was unchecked at the time of our first census in 1975, new infections had been halted by the second one in 1985, and symptoms were fully controlled by the third and fourth censuses in 1996 and 2006. Given concerns about serial correlation when difference-in-difference models extend over several years (Bertrand, Duflo and Mullainathan 2004), our preferred specification is to divide the sample into pre- and

post-treatment periods (1975 versus 1985-2006). We also show estimation results where the baseline is defined as the period 1975-1985 and the post treatment period as 1996-2006, i.e. when symptoms have been fully controlled. Finally, to allow for changes in impact of treatment over time, we show estimation results that use each year's data (with 1975 as baseline), although as shown by Bertrand, Duflo and Mullainathan (2004), the standard errors of these estimates are plausibly under-estimated leading to an over-rejection of the null hypothesis that OCP rollout did not have any impact.

Disease burdens and hence OCP treatment could influence public actions directly via the productivity of investments in labor, land and capital. Disease burdens could also matter via population size and density as suggested by Boserup (1965). These pathways run together, and may be indistinguishable. Our strategy is to explore them separately, by regressing village population size and institutional choices on treatment status using difference-in-difference specifications. We also test the Boserup hypothesis alone, imposing the assumption that disease burdens work only through population density.

We estimate the direct effects of OCP on village population and on public institutions in regressions (1) and (2). For population, we estimate:

$$Pop_{jt} = \alpha_1 + \beta_{11}(Treat_j \times Time_t) + \beta_{12}(Time_t) + \gamma_{1j} + \varepsilon_{1jt} \qquad (1)$$

where β_{11} is an estimate of the average effect of treatment on village population (Pop_{jt}), across villages and time periods indexed by j and t, controlling for a common time effect β_{12} and village fixed effects γ_{1j}.

For the actions of local institutions, we estimate:

$$I_{kjt} = \alpha_{2k} + \beta_{21k}(Treat_j \times Time_t) + \beta_{22k}(Time_t) + \gamma_{2kj} + \varepsilon_{2kjt} \qquad (2)$$

where $\beta_{21\mathrm{k}}$ estimates the average treatment effect on local institutions' choices (I_{kjt}) for the kth outcome, across villages and time periods indexed by j and t, controlling for a common time effect β_{22k} and village fixed effects γ_{2kj}.

We also consider the pure Boserup hypothesis with a regression of institutional choices on population size. The stripped down version of that hypothesis is that local institutions,

including amenities and land rights react to changes in population density, in a relationship of the form:

$$I_{kjt} = \alpha_{3k} + \beta_{31k}(Pop_{jt}) + \beta_{32k}(Time_t) + \gamma_{3kj} + \varepsilon_{3kjt} \quad (3)$$

Here, β_{31k} is the coefficient of interest, but population is endogenous to institutional choices. An OLS estimate of regression (3) would be subject to reverse causality bias, as people may join villages in part because of the amenities or land rights available there, and also omitted variable bias, as unobserved factors such as village leadership quality could influence both institutional choices and migration to or from the village. To test the Boserup effect we would need a quasi-experimental, exogenous source of variance in village population. Here we illustrate such a test using the difference-in-difference results of equation (1) as a first stage in 2SLS estimation of equation (3). This estimate of population's effect on institutional choices would be unbiased if OCP treatment impacted institutional choices only through changing village population size, and not through other channels. That exclusion restriction is untestable, so we treat equation (3) as illustrative and focus the analysis on equations (1) and (2), using a difference-in-difference approach to identify the degree to which disease control changed rural demography and local institutional development.

Results and Discussion

The results of estimating equation (1) are reported in Table 3, with separate columns for the three different time-period comparisons. The first column compares the baseline (1975) to pooled observations after treatment began (1985, 1996 and 2006). The second compares the period before and during initial adjustment (1975 and 1985) to the post-treatment period (1996 and 2006). Finally, we also compare the baseline to each subsequent year separately. In all three time-period comparisons, village populations increase significantly faster in the treatment areas. Population is expressed in log form, so the coefficients are semi-elasticities. From column 1, village populations were 33 percent larger in OCP areas after treatment began, comparing 1975 to the three later censuses in 1985, 1996 and 2006. Some but not all of that adjustment occurred in the first decade after treatment began. From column 2, populations were 25 percent larger when comparing 1975-1985 to 1996-2006. The year-by-year estimates in column 3 show

treatment raising village population in OCP as opposed to other areas to 24 percent above baseline levels in 1985, and then 39 percent above that baseline in 1996 and 2006. In all three columns the difference-in-difference point estimates are significant at the one percent level, although the standard errors in column (3) may be underestimated as we discussed above.

Results of estimating equations (2) and (3) are reported first for property rights in Tables 4, 5 and 6, followed by the results for public amenities. In each of these tables, the three different time-period comparisons are shown, first Panel A where the difference-in-difference estimate compares 1975 to the entire 1985-2006 period, then Panel B compares 1975-86 to 1996-2006, and finally Panel C provides the naïve regression with three year-to-year changes that might be subject to serial correlation. The property-rights regressions all control for 615 village fixed effects, with an average of 3.75 observations per village for a total of 2,307 observations.

Table 4 reports results for equation (2), showing that land transactions are about 4 percent more likely to be observed after treatment in the OCP area, and also generally less likely to require a permit. There is also some evidence of significant increases in the regulation of pasture and forest access, and for assigning land rights to individuals when we compare 1975-85 to 1996-2006. The contrast between the panels provide some suggestive evidence about how institutional adjustment took place over time after treatment began, as cropland transactions (Column 2) were significantly more common in treated areas immediately after the OCP began operations in 1975 (Panel A), whereas cropland rights (Column 1) were more often assigned to individuals only after 1985 (Panel B), especially after 1996 (Panel C). Similarly slow adjustment appears for other land tenure dimensions shown in columns 2-5, although less marked.

Tables 5 and 6 report results of estimating equation (3), showing first the OLS estimates linking changes in village population to changes in institutional choices, and then 2SLS estimates attempting to correct for endogeneity of population change. The OLS estimates in Table 5 rely only on the village fixed effects for identification, while the 2SLS estimates in Table 6 also impose the untestable exclusion restriction that OCP treatment affects institutional choices only through population. Table 5 reveals a robust link to property rights from village population only for the probability of land transactions, with an estimated semi-elasticity of 0.02 across all three time period differences. Table 6 suggests a higher semi-elasticity for land transactions and also significant effects for some other land rights. The first stage for these regressions is Table 3, with

the interaction terms as excluded instruments. In each column of Table 3 we report the F-test of the null hypothesis that the excluded instruments are jointly insignificant. The null hypothesis can be rejected at the one-percent level for all cases. Moreover, the F-statistics meet the rule of thumb cut-off suggested by Stock and Yogo (2005) in columns 1 and 2, which is an indication of the explanatory power of our instruments. Their validity is untestable, so we conclude only that our difference-in-difference results for land transactions are robust across both the OLS and 2SLS specifications.

Tables 7, 8 and 9 show results of estimating equations (2) and (3) for villages' distance to public amenities. In these tables, we suppress columns for four of the 21 amenities that were included in our questionnaire but showed no statistical significance associated with treatment status or village population in any of these specifications. The suppressed variables that did not change to a statistically significant degree are the villages' distance to administrative centers where births are registered, roads that are passable year-round, access to cell phone reception and large wells. The remaining 17 variables had at least one statistically significant difference other than time effects, and are shown here.

In Table 7, for equation (2), the public amenities that come to be provided closer to Onchocerciasis-affected villages after treatment are banking, electricity and landline telephone service, public markets, wells and primary schools. Their increasing proximity is generally robust to all three definitions of pre- and post-treatment time periods. The largest effect is for banking services and electricity, which are brought over 10 km closer to villages when comparing 1975 to all later years in our preferred specification (Panel A). Public markets and primary schools are brought about 2 km closer to villages, in all three time period specifications. Contrasting these magnitudes to the baseline differences shown in Table 2, the initial gap between treated and control-area villages in their distance to banking and electricity was 35 and 33 km respectively, whereas the gap in distance to public markets and primary schools was about 3 km.

In Table 8, for equation (3), population changes are shown to be a robustly significant correlate of changes in distance to banks, telephones, public markets and secondary schools. There is also some evidence of correlation between changing population and changing distance to roads and boreholes, at a lower level of significance. Table 9 presents these relationships using

predicted population change from equation (1), in 2SLS estimates that exclude treatment from any effect other than through population. The first stage for these regressions is of the form shown in Table 3, but with samples restricted to the number of observations for each amenity shown in the bottom two rows. These instrumented regressions produce larger coefficients than their OLS counterparts, but are less precise. Only public markets become significantly closer to villages at a 95 percent confidence level across all of the time periods shown in the three panels. Primary schools and telephones become closer, but significantly so only at a 90 percent confidence level in some of the time period specifications.

Conclusion

This paper uses variance in population size, land use rights and distance to specific amenities in a nationally representative sample of 615 villages to examine how rural demography and public institutions responded to Onchocerciasis disease control in Burkina Faso between 1975 and 2006. Our central hypothesis is that river blindness control led to larger village populations in treated areas, with more market-oriented property rights over land use and closer provision of public services and infrastructure. Our data on rural demography come from four national censuses, in 1975 (just before the blackfly vector transmitting the disease was targeted by the Onchocerciasis Control Program), 1985 (just before the OCP distributed ivermectin to block symptoms among those already infected), 1996 (after vector control ceased and new symptoms were no longer widely felt), and 2006 (after the OCP ended). Each village's exposure to Onchocerciasis is captured by its presence in the treated zone, and our data on rural institutions' response come from a new survey of village elders designed to document changes over time in their land-use rights and distance to frequently used amenities.

Results show strong links between disease control, rural demography and institutional response. Before treatment began in 1975, villages in the Onchocerciasis zone had significantly smaller populations than villages elsewhere. Treated villages then expanded by 25-33 percent depending on the time period specified, cutting the difference in average village size to statistical insignificance in 2006. Similarly, in 1975 villages in the Onchocerciasis zone were significantly less likely than others to assign cropland property rights to individuals, and more likely to require permits for land transactions. After treatment, those villages were significantly more likely to

have land transactions, and less likely to require permits before those transactions. They also came to be more closely served by rural amenities, especially public markets and also primary schooling and telephone service. These differences could have occurred through the Boserup effect of treatment on population size, or could have occurred more directly through shifts in village productivity.

An important feature of our study is its' use of village elders' recall data to construct time-varying measures of the actions taken by local public institutions. This involves asking about villagers' use of specific agricultural property rights and their access to specific public services. The resulting data offer rich detail about how well each village is served by local public institutions, demonstrating the potential of this approach to help overcome the limited availability of reliable evidence from other sources on variation in land use rights, public services or other choices made by local institutions.

In the particular setting of rural Burkina Faso, we find that a major regional disease control effort led to significant changes in village sizes, more market-oriented land use rights, and closer provision of some public amenities. Such demographic and institutional changes are clearly of great importance for Africa and other regions where endemic diseases are rooted in particular locations. Future work using similar data sources could document further how public health interventions change the rural landscape and the prospects for economic development.

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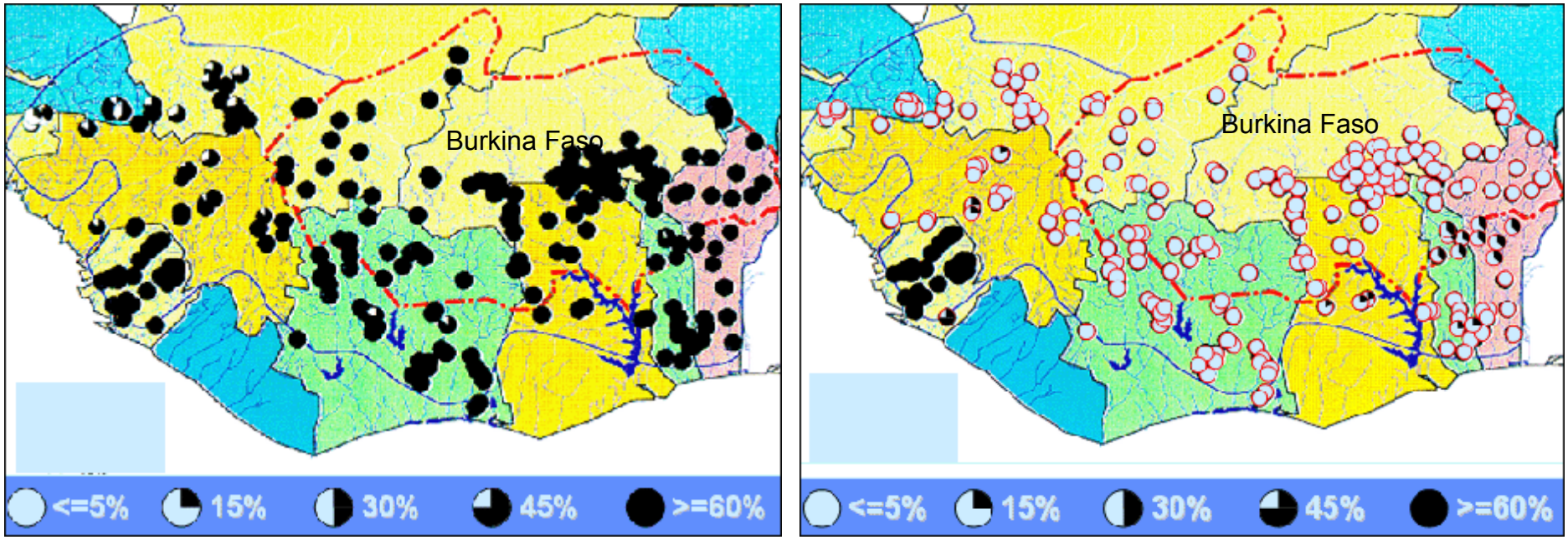
Figure 1. Estimated Onchocerciasis Prevalence in West Africa

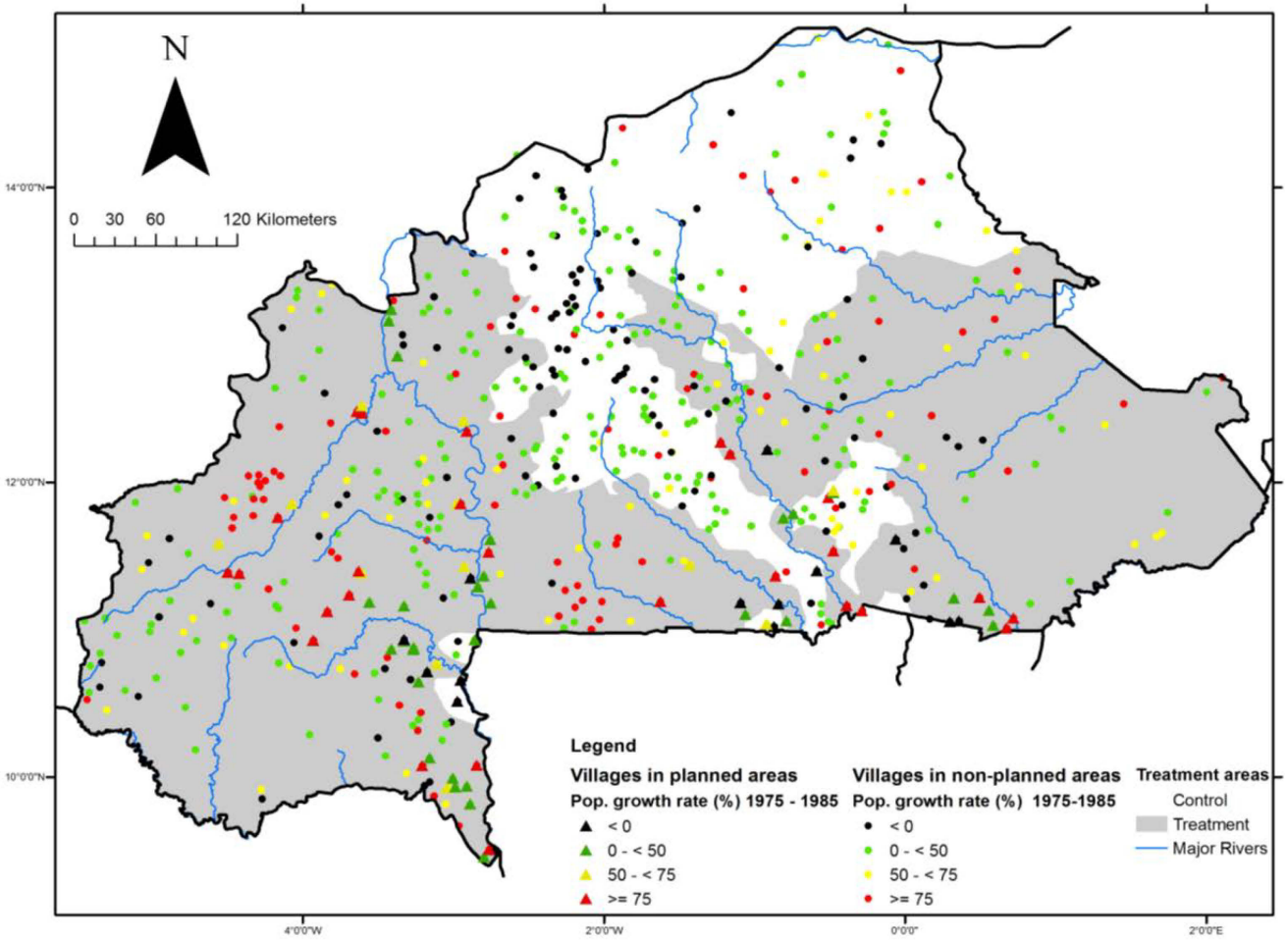
Panel (a): Prior to control (1974)

Panel (b): After control (2002)



Source: WHO, Onchocerciasis Control Programme (www.who.int/apoc/onchocerciasis/ocp).

Figure 2. Village Location, Population Growth from 1975 to 1985 and Onchocersiasis Treatment Areas in Burkina Faso



Source: Authors' calculations. Population growth is from Burkina Faso census data of 1975 and 1985. Areas of Onchocerciasis treatment and village planning are from OCP file data, courtesy of Bruce Benton. Location of rivers is from IFPRI mapping file data; location of surveyed villages is from authors' survey data.

Table 1: Mean, standard deviation, and sample size for all variables in each year

Panel A: Village population and indicators of agricultural land-use rights

	Village population (from census)	Land rights assigned to individuals	Land transactions occurred	Pasture access is regulated	Forest access is regulated	Land transactions require permit
Year = 1975	1,266	0.378	0.846	0.228	0.075	0.335
	(1,248)	(0.485)	(0.361)	(0.420)	(0.263)	(0.473)
Year = 1985	1,637	0.400	0.862	0.293	0.096	0.348
	(1,561)	(0.490)	(0.346)	(0.456)	(0.294)	(0.477)
Year = 1996	1,659	0.409	0.868	0.350	0.135	0.352
	(1,413)	(0.492)	(0.339)	(0.477)	(0.342)	(0.478)
Year = 2006	1,414	0.435	0.889	0.425	0.173	0.371
	(2,597)	(0.496)	(0.314)	(0.495)	(0.378)	(0.484)
Observations	2,307	2,307	2,307	2,307	2,307	2,307
Villages	615	615	615	615	615	615

Panel B: Distance from village to nearest public amenity (km)

	Transport		Services			Markets		
	Road	Bus Stop	Bank	Electricity	Telephone	Public	Livestock	Private
Year = 1975	3.79	17.60	49.03	57.17	40.84	7.85	20.67	5.63
	(7.21)	(22.86)	(47.49)	(43.69)	(35.48)	(16.80)	(30.26)	(10.08)
Year = 1985	4.34	13.93	39.29	51.12	37.11	5.73	22.46	5.18
	(13.92)	(18.55)	(35.52)	(36.07)	(31.71)	(8.10)	(29.82)	(8.90)
Year = 1996	4.91	12.99	35.12	46.91	28.28	5.28	20.55	4.68
	(14.21)	(17.43)	(30.91)	(33.86)	(24.64)	(8.12)	(26.01)	(9.02)
Year = 2006	4.32	10.64	25.81	36.73	21.34	4.85	17.07	2.09
	(13.44)	(15.82)	(24.21)	(26.39)	(19.67)	(7.52)	(20.57)	(5.25)
Observations	1,433	1,719	1,084	1,227	1,589	2,216	1,042	1,228
Villages	449	518	559	462	557	601	339	549

	Water			Schooling and Health			Religious Services		
	Well	Borehole	Dam	Primary	Secondary	Clinic	Church	Mosque	Temple
Year = 1975	1.11	1.52	18.59	10.73	51.74	16.30	8.95	5.46	9.48
	(4.69)	(4.95)	(21.76)	(12.84)	(39.86)	(17.33)	(13.55)	(11.40)	(12.14)
Year = 1985	0.74	0.63	18.12	6.94	40.14	12.70	4.88	3.92	5.09
	(3.42)	(2.90)	(20.10)	(11.74)	(33.60)	(13.83)	(9.73)	(7.30)	(8.85)
Year = 1996	0.89	0.57	16.91	3.73	26.07	8.79	4.97	3.88	5.09
	(3.33)	(2.69)	(19.02)	(8.46)	(24.02)	(10.56)	(9.84)	(7.29)	(8.95)
Year = 2006	0.30	0.33	15.41	1.14	17.32	5.91	3.55	2.63	3.01
	(1.30)	(2.07)	(18.15)	(4.43)	(16.66)	(6.76)	(8.65)	(5.73)	(6.42)
Observations	1,041	1,062	753	2,025	1,681	2,055	1,694	1,777	1,410
Villages	322	414	249	573	528	574	471	505	411

Notes: All data are from authors' survey of village elders in 2010, except village population which is from Burkina Faso national censuses. Indicators in Panel A are 1 if the condition shown is met, and zero otherwise, with no missing values recorded. Distances in Panel B have missing values where no answer was recorded. The specific wording of each question is reproduced in the online appendix. These summary statistics are for our preferred sample, excluding villages in AVV planning areas.

Table 2: Mean, standard deviation and difference between treated and control areas in the baseline year (1975)

	Treated	Control	Difference
Village population	1130.703	1468.08	-337.378***
	[70.242]	[90.799]	[114.797]
Indicators of agricultural land-use rights			
Land rights assigned to individuals	0.328	0.452	-0.125***
	[0.027]	[0.035]	[0.045]
Land transactions occurred	0.834	0.864	-0.030
	[0.022]	[0.024]	[0.033]
Pasture access is regulated	0.206	0.261	-0.055
	[0.024]	[0.031]	[0.039]
Forest access is regulated	0.084	0.06	0.024
	[0.016]	[0.017]	[0.023]
Land transactions require permit	0.389	0.256	0.132***
	[0.028]	[0.031]	[0.042]
Distance from village to nearest public amenity (km)			
Road	4.196	3.192	1.004
	[0.618]	[0.639]	[0.889]
Bus Stop	18.354	16.408	1.946
	[1.627]	[2.160]	[2.704]
Bank	66.361	31.200	35.161***
	[9.633]	[3.998]	[10.429]
Electricity	73.061	39.800	33.261***
	[4.903]	[4.133]	[6.412]
Telephone	45.46	32.862	12.598***
	[3.165]	[2.934]	[4.316]

	Treated	Control	Difference
Continued from previous column			
Distance from village to nearest public amenity (km)			
Public Market	9.092	5.934	3.158**
	[1.194]	[0.713]	[1.390]
Livestock Market	25.140	15.013	10.127**
	[3.584]	[2.253]	[4.233]
Private Shop	6.231	4.750	1.481
	[1.470]	[1.011]	[1.784]
Water Well	1.658	0.429	1.230*
	[0.694]	[0.143]	[0.709]
Borehole	0.833	2.154	-1.321
	[0.833]	[1.764]	[1.951]
Dam	24.96	8.625	16.335***
	[3.490]	[1.823]	[3.937]
Primary School	11.818	9.068	2.750**
	[0.820]	[1.112]	[1.382]
Secondary Sch.	56.294	44.958	11.335**
	[3.221]	[4.190]	[5.284]
Health Clinic	16.603	15.828	0.775
	[1.086]	[1.440]	[1.803]
Church	9.692	8.000	1.692
	[1.052]	[1.146]	[1.556]
Mosque	6.236	4.200	2.036*
	[1.006]	[0.657]	[1.201]
Temple	10.189	8.580	1.610
	[1.263]	[1.119]	[1.687]

Notes: Approximately 60 percent of surveyed villages are in treated areas. Significance levels for t-tests of difference between villages in treated and control areas are shown are *** p<0.01, ** p<0.05, and * p<0.1.

Table 3: OLS results for village population on Onchocerciasis treatment status and time

Dependent variable: log of village population	Post-75 (1)	Post-85 (2)	Annual Data (3)
Treated X Post-75 (1985-2006)	0.33***		
	(0.08)		
Treated X Post-85 (1996-2006)		0.25***	
		(0.07)	
Treated X 1985			0.24***
			(0.09)
Treated X 1996			0.39***
			(0.09)
Treated X 2006			0.39***
			(0.11)
Post-75 (1985-2006)	0.09		
	(0.06)		
Post-85 (1996-2006)		-0.09*	
		(0.05)	
Year = 1985			0.21***
			(0.06)
Year = 1996			0.17**
			(0.07)
Year = 2006			-0.11
			(0.09)
Constant	6.68***	6.88***	6.68***
	(0.03)	(0.02)	(0.03)
R-squared	0.47	0.45	0.48
F-Stat Inst.	17.59	12.44	7.137
p value	0.000	0.000	0.000

Notes: All regressions have 2,307 observations and control for 615 village fixed effects, with robust standard errors in parentheses estimated using the areg command in Stata 12. Significance levels shown are *** p<0.01, ** p<0.05, and * p<0.1. F-test and p values are shown for the treatment variables, which are used to instrument population in the 2SLS regressions in Tables 6 and 9. These results are the first stage for Table 6, while Table 9 uses smaller samples as indicated there.

Table 4: OLS results for property rights on Onchocerciasis treatment status and time

Dependent variable:	Land rights assigned to individuals	Land transactions occurred	Pasture access is regulated	Forest access is regulated	Land transactions require permit
	(1)	(2)	(3)	(4)	(5)
Panel A: Post-1975					
Treated X Post-75 (1985-2006)	0.02	0.04***	0.02	0.03*	-0.04***
	(0.01)	(0.01)	(0.03)	(0.02)	(0.01)
Time = 1985-2006	0.02**	0.00	0.11***	0.04***	0.04***
	(0.01)	(0.00)	(0.02)	(0.01)	(0.01)
Constant	0.39***	0.84***	0.23***	0.08***	0.34***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
R-squared	0.96	0.92	0.83	0.83	0.96
Panel B: Post-1985					
Treated X Post-85 (1996-2006)	0.02**	0.04***	0.05***	0.02*	-0.05***
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
Time = 1996-2006	0.02***	0.00*	0.09***	0.05***	0.04***
	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)
Constant	0.39***	0.85***	0.26***	0.09***	0.34***
	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)
R-squared	0.96	0.93	0.84	0.84	0.96
Panel C: Annual Data					
Treated X 1985	0.00	0.03**	-0.01	0.02	-0.02
	(0.01)	(0.01)	(0.03)	(0.02)	(0.02)
Treated X 1996	0.01	0.04***	0.03	0.03	-0.05***
	(0.01)	(0.01)	(0.03)	(0.02)	(0.02)
Treated X 2006	0.03**	0.07***	0.05	0.04*	-0.07***
	(0.01)	(0.01)	(0.03)	(0.02)	(0.02)
Year = 1985	0.01	0.00	0.07***	0.00	0.02
	(0.01)	(0.00)	(0.02)	(0.01)	(0.01)
Year = 1996	0.02**	0.00	0.10***	0.04***	0.04***
	(0.01)	(0.00)	(0.02)	(0.01)	(0.01)
Year = 2006	0.03***	0.00	0.17***	0.07***	0.07***
	(0.01)	(0.00)	(0.02)	(0.01)	(0.01)
Constant	0.39***	0.84***	0.23***	0.08***	0.34***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
R-squared	0.96	0.93	0.85	0.84	0.96

Notes: All regressions have 2,307 observations and control for 615 village fixed effects, with robust standard errors in parentheses estimated using the areg command in Stata 12.Significance levels shown are *** p<0.01, ** p<0.05, and * p<0.1.

Table 5: OLS results for property rights on village population and time

Dependent variable:	Land rights assigned to individuals	Land transactions occurred	Pasture access is regulated	Forest access is regulated	Land transactions require permit
	(1)	(2)	(3)	(4)	(5)
Panel A: Post-1975					
Population (log)	-0.00	0.02***	-0.01	-0.00	0.00
	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)
Time = 1985-2006	0.03***	0.03***	0.13***	0.05***	0.01**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Constant	0.39***	0.74***	0.29***	0.10**	0.34***
	(0.02)	(0.03)	(0.05)	(0.04)	(0.02)
R-squared	0.96	0.93	0.83	0.83	0.95
Panel B: Post-1985					
Population (log)	0.00	0.02***	-0.00	0.00	0.00
	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)
Time = 1996-2006	0.03***	0.03***	0.12***	0.06***	0.02***
	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)
Constant	0.38***	0.74***	0.27***	0.09**	0.34***
	(0.02)	(0.03)	(0.05)	(0.04)	(0.02)
R-squared	0.96	0.93	0.84	0.84	0.96
Panel C: Annual Data					
Population (log)	0.00	0.02***	-0.00	0.00	0.00
	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)
Year = 1985	0.01	0.01*	0.07***	0.01	0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Year = 1996	0.03***	0.02***	0.12***	0.05***	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Year = 2006	0.04***	0.04***	0.20***	0.09***	0.03***
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
Constant	0.37***	0.73***	0.24***	0.07*	0.33***
	(0.02)	(0.03)	(0.05)	(0.04)	(0.02)
R-squared	0.96	0.93	0.85	0.84	0.96

Notes: All regressions have 2,307 observations and control for 615 village fixed effects, with robust standard errors in parentheses estimated using the areg command in Stata 12. Significance levels shown are *** $p<0.01$, ** $p<0.05$, and * $p<0.1$.

Table 6: 2SLS results for property rights on predicted village population and time

Dependent variable:	Land rights assigned to individuals (1)	Land transactions occurred (2)	Pasture access is regulated (3)	Forest access is regulated (4)	Land transactions require permit (5)
Panel A: Post-1975					
Population (log)	0.05	0.13***	0.06	0.08*	-0.13**
	(0.04)	(0.04)	(0.08)	(0.05)	(0.05)
Time = 1985-2006	0.01	-0.01	0.11***	0.03*	0.05***
	(0.01)	(0.01)	(0.03)	(0.02)	(0.02)
Panel B: Post-1985					
Population (log)	0.08*	0.15***	0.19**	0.09	-0.19***
	(0.04)	(0.05)	(0.09)	(0.06)	(0.07)
Time = 1996-2006	0.03***	0.02***	0.11***	0.06***	0.03***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Panel C: Annual Data					
Population (log)	0.06*	0.14***	0.12	0.09*	-0.16***
	(0.03)	(0.04)	(0.07)	(0.05)	(0.05)
Year = 1985	-0.01	-0.03**	0.02	-0.02	0.06***
	(0.01)	(0.01)	(0.03)	(0.02)	(0.02)
Year = 1996	0.00	-0.03*	0.08**	0.02	0.07***
	(0.01)	(0.02)	(0.03)	(0.02)	(0.03)
Year = 2006	0.04***	0.03***	0.18***	0.08***	0.04***
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)

Notes: All regressions have 2,307 observations and control for 615 village fixed effects, with robust standard errors in parentheses estimated using the xtivreg command in Stata 12. Significance levels shown are *** $p<0.01$, ** $p<0.05$, and * $p<0.1$.The first stage regression for each panel is shown in Table 3.

Table 7: OLS results for public amenities on Onchocerciasis treatment status and time

Dependent variable	Transport		Services			Markets		
Distance to nearest:	Road	Bus Stop	Bank	Electricity	Telephone	Public	Livestock	Private
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Post-1975								
Treated X Post-75								
(1985-2006)	-0.26	1.50	-12.98*	-10.35***	-8.32***	-2.81***	-2.82	-1.01
	(0.43)	(1.84)	(7.83)	(3.99)	(2.72)	(1.00)	(2.04)	(1.11)
Time = 1985-2006	-0.50	-6.83***	-8.63***	-4.86**	-7.56***	-1.11***	-1.75*	-1.23**
	(0.31)	(1.57)	(3.23)	(1.94)	(1.57)	(0.29)	(0.92)	(0.50)
Constant	4.93***	18.18***	47.24***	55.30***	40.58***	8.07***	22.69***	5.35***
	(0.25)	(0.79)	(4.36)	(2.13)	(1.37)	(0.59)	(0.97)	(0.59)
R-squared	0.86	0.82	0.82	0.82	0.72	0.68	0.84	0.81
Panel B: Post-1985								
Treated X Post-85								
(1996-2006)	-0.65	0.28	-4.58	-5.64**	-6.09***	-1.42***	-4.43***	-0.31
	(0.48)	(1.08)	(3.92)	(2.35)	(2.01)	(0.52)	(1.62)	(0.68)
Time = 1996-2006	-0.36*	-5.05***	-9.35***	-6.11***	-10.81***	-0.84***	-2.07**	-1.79***
	(0.19)	(0.91)	(1.98)	(1.45)	(1.37)	(0.17)	(0.81)	(0.44)
Constant	4.83***	16.13***	41.57***	51.62***	38.83***	6.72***	22.62***	5.13***
	(0.19)	(0.39)	(1.95)	(0.92)	(0.79)	(0.28)	(0.59)	(0.28)
R-squared	0.86	0.82	0.82	0.82	0.75	0.67	0.85	0.81
Panel C: Annual Data								
Treated X 1985	0.25	1.85	-12.08	-8.08**	-5.70*	-2.59**	0.12	-1.00
	(0.57)	(1.91)	(8.15)	(4.07)	(2.94)	(1.03)	(2.16)	(1.15)
Treated X 1996	0.30	1.62	-11.89	-10.58**	-10.35***	-2.74***	-4.09*	-0.95
	(0.58)	(1.89)	(7.99)	(4.12)	(2.86)	(1.04)	(2.19)	(1.14)
Treated X 2006	-1.26*	1.10	-14.98*	-12.32***	-8.89***	-3.08***	-4.55*	-1.07
	(0.69)	(2.03)	(8.10)	(4.57)	(3.13)	(1.04)	(2.68)	(1.27)
Year = 1985	-0.36	-4.77***	-3.12	-1.16	-0.51	-0.79***	-0.52	-0.06
	(0.32)	(1.63)	(3.32)	(2.09)	(1.74)	(0.30)	(0.92)	(0.55)
Year = 1996	-0.31	-6.85***	-7.29**	-2.37	-6.80***	-1.15***	-0.65	-0.79
	(0.33)	(1.61)	(3.30)	(2.10)	(1.65)	(0.30)	(0.96)	(0.55)
Year = 2006	-0.82**	-8.88***	-15.48***	-11.05***	-15.37***	-1.41***	-4.03***	-2.80***
	(0.34)	(1.74)	(3.45)	(2.45)	(2.00)	(0.32)	(1.43)	(0.63)
Constant	4.97***	18.29***	50.04***	56.31***	41.60***	8.07***	22.96***	5.72***
	(0.25)	(0.79)	(4.39)	(2.14)	(1.37)	(0.59)	(0.97)	(0.59)
R-squared	0.86	0.83	0.84	0.83	0.77	0.68	0.85	0.82
Observations	1,433	1,719	1,084	1,227	1,589	2,216	1,042	1,228
Number of villages	449	518	559	462	557	601	339	549

Notes: Robust standard errors in parentheses, estimated using the areg command in Stata 12. Significance levels shown are *** p<0.01, ** p<0.05, and * p<0.1. All distances are in kilometers.

Table 7 (cont'd.): OLS results for public amenities on Onchocerciasis treatment status and time

Dependent variable	Water			Schooling and Health			Religious Services		
Distance to nearest	Well	Borehole	Dam	Primary	Secondary	Clinic	Church	Mosque	Temple
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
Panel A: Post-1975									
Treated X Post-75 (1985-2006)	-0.79*	0.38	-0.20	-2.38**	-3.99	-0.89	-1.61	-1.38	-1.09
	(0.44)	(0.32)	(1.41)	(1.05)	(4.04)	(1.32)	(0.98)	(0.88)	(1.24)
Time=1985-2006	-0.08	-0.38	-1.75*	-5.99***	-21.04***	-6.99***	-3.66***	-1.80***	-4.12***
	(0.07)	(0.32)	(1.04)	(0.83)	(3.03)	(1.04)	(0.56)	(0.47)	(0.76)
Constant	1.16***	0.64***	18.47***	11.16***	50.16***	16.47***	9.07***	5.97***	9.15***
	(0.23)	(0.14)	(0.66)	(0.48)	(1.81)	(0.60)	(0.52)	(0.47)	(0.65)
R-squared	0.69	0.86	0.97	0.57	0.62	0.62	0.83	0.77	0.79
Panel B: Post-1985									
Treated X Post-85 (1996-2006)	-0.58**	-0.15	-1.74**	-2.06***	-4.97**	-1.41*	-0.80	-0.71*	-0.84
	(0.24)	(0.22)	(0.70)	(0.72)	(2.50)	(0.84)	(0.50)	(0.40)	(0.53)
Time=1996-2006	-0.06*	-0.19	-0.79**	-5.25***	-20.22***	-6.29***	-1.78***	-1.08***	-1.69***
	(0.03)	(0.12)	(0.39)	(0.53)	(1.94)	(0.64)	(0.30)	(0.22)	(0.33)
Constant	0.93***	0.71***	17.99***	8.72***	44.59***	14.36***	6.49***	4.62***	6.31***
	(0.10)	(0.11)	(0.29)	(0.30)	(0.94)	(0.33)	(0.22)	(0.19)	(0.24)
R-squared	0.69	0.86	0.97	0.59	0.68	0.64	0.82	0.76	0.77
Panel C: Annual Data									
Treated X 1985	-0.50	0.50	1.16	-1.36	-0.67	0.07	-1.26	-1.19	-0.50
	(0.44)	(0.35)	(1.44)	(1.16)	(4.22)	(1.40)	(1.00)	(0.89)	(1.25)
Treated X 1996	-0.55	0.17	-0.19	-2.61**	-6.56	-1.30	-1.23	-1.19	-0.57
	(0.43)	(0.35)	(1.44)	(1.15)	(4.18)	(1.42)	(1.00)	(0.90)	(1.26)
Treated X 2006	-1.27**	0.45	-1.53	-3.18***	-4.77	-1.39	-2.30**	-1.72*	-2.14*
	(0.52)	(0.34)	(1.51)	(1.17)	(4.24)	(1.46)	(1.06)	(0.94)	(1.30)
Year = 1985	-0.06	-0.27	-1.48	-3.40***	-10.04***	-3.88***	-3.37***	-1.38***	-3.82***
	(0.07)	(0.33)	(1.04)	(0.90)	(3.19)	(1.08)	(0.58)	(0.48)	(0.77)
Year = 1996	-0.02	-0.23	-1.68	-6.19***	-21.58***	-7.17***	-3.39***	-1.44***	-3.82***
	(0.07)	(0.33)	(1.05)	(0.91)	(3.19)	(1.12)	(0.58)	(0.48)	(0.77)
Year = 2006	-0.18**	-0.62*	-2.07*	-8.39***	-31.52***	-9.93***	-4.20***	-2.57***	-4.70***
	(0.08)	(0.33)	(1.10)	(0.92)	(3.24)	(1.16)	(0.59)	(0.51)	(0.79)
Constant	1.19***	0.70***	18.60***	11.27***	51.47***	16.59***	9.09***	6.00***	9.21***
	(0.24)	(0.14)	(0.66)	(0.48)	(1.80)	(0.59)	(0.52)	(0.47)	(0.65)
R-squared	0.70	0.87	0.97	0.62	0.70	0.66	0.84	0.78	0.80
Observations	1,104	1,227	794	2,061	1,745	2,083	1,728	1,838	1,470
Number of villages	385	579	290	609	592	602	505	566	471

Notes: Robust standard errors in parentheses, estimated using the areg command in Stata 12. Significance levels shown are *** p<0.01, ** p<0.05, and * p<0.1. All distances are in kilometers.

Table 8: OLS results for public amenities on village population and time

Dependent variable	Transport		Services			Markets		
Distance to nearest:	Road	Bus Stop	Bank	Electricity	Telephone	Public	Livestock	Private
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Post-1975								
Population (log)	-0.26*	-0.55	3.23***	0.80	2.92***	-0.47***	0.73	0.01
	(0.14)	(0.39)	(1.02)	(0.99)	(0.77)	(0.15)	(0.62)	(0.20)
Time=1985-2006	-0.57***	-5.75***	-16.45***	-10.40***	-13.54***	-2.67***	-3.54***	-1.83***
	(0.22)	(0.81)	(4.08)	(2.05)	(1.56)	(0.58)	(1.12)	(0.61)
Constant	6.65***	21.91***	24.95***	48.85***	21.10***	11.15***	17.74***	5.32***
	(1.02)	(2.98)	(7.11)	(7.48)	(5.26)	(1.32)	(4.24)	(1.67)
R-squared	0.86	0.82	0.82	0.81	0.72	0.68	0.84	0.81
Panel B: Post-1985								
Population (log)	-0.27*	-0.89**	2.71***	0.65	2.43***	-0.68***	0.75	-0.15
	(0.14)	(0.40)	(0.98)	(0.99)	(0.71)	(0.17)	(0.61)	(0.21)
Time=1996-2006	-0.73***	-4.82***	-12.20***	-9.60***	-14.83***	-1.66***	-4.71***	-1.99***
	(0.28)	(0.49)	(2.11)	(1.26)	(1.07)	(0.30)	(0.89)	(0.37)
Constant	6.69***	22.31***	22.98***	47.04***	22.17***	11.36***	17.45***	6.19***
	(1.02)	(2.97)	(6.74)	(7.02)	(4.91)	(1.34)	(4.17)	(1.63)
R-squared	0.86	0.82	0.82	0.82	0.75	0.67	0.85	0.81
Panel C: Annual Data								
Population (log)	-0.36**	-0.87**	2.16**	0.09	2.04***	-0.54***	0.57	-0.37*
	(0.15)	(0.40)	(0.97)	(0.95)	(0.69)	(0.16)	(0.63)	(0.21)
Year = 1985	-0.08	-3.34***	-10.04**	-5.14**	-4.66***	-2.15***	-0.56	-0.52
	(0.32)	(0.85)	(4.26)	(2.07)	(1.66)	(0.59)	(1.18)	(0.62)
Year = 1996	0.03	-5.49***	-14.25***	-7.94***	-14.10***	-2.57***	-3.17**	-1.26**
	(0.33)	(0.84)	(4.21)	(2.08)	(1.64)	(0.60)	(1.24)	(0.61)
Year = 2006	-1.53***	-8.10***	-23.85***	-17.72***	-21.19***	-3.20***	-6.73***	-3.46***
	(0.39)	(0.91)	(4.18)	(2.38)	(1.71)	(0.61)	(1.43)	(0.70)
Constant	7.33***	24.14***	34.62***	54.66***	28.00***	11.65***	19.10***	8.31***
	(1.04)	(3.08)	(6.86)	(7.22)	(4.69)	(1.35)	(4.26)	(1.78)
R-squared	0.86	0.83	0.84	0.83	0.77	0.68	0.85	0.82
Observations	1,433	1,719	1,084	1,227	1,589	2,216	1,042	1,228
Number of villages	449	518	559	462	557	601	339	549

Notes: Robust standard errors in parentheses, estimated using the areg command in Stata 12. Significance levels shown are *** p<0.01, ** p<0.05, and * p<0.1. All distances are in kilometers.

Table 8 (cont'd.): OLS results for public amenities on village population and time

Dependent variable	Water			Schooling and Health			Religious Services		
Distance to neares	Well	Borehole	Dam	Primary	Secondary	Clinic	Church	Mosque	Temple
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
Panel A: Post-1975									
Population (log)	0.28	0.10*	0.15	0.13	3.58***	0.41	0.02	0.15	0.27
	(0.18)	(0.05)	(0.18)	(0.23)	(0.88)	(0.34)	(0.18)	(0.19)	(0.19)
Time=1985-2006	-0.60**	-0.20	-1.91***	-7.46***	-24.56***	-7.65***	-4.57***	-2.69***	-4.78***
	(0.26)	(0.17)	(0.70)	(0.51)	(2.03)	(0.64)	(0.52)	(0.51)	(0.64)
Constant	-0.80	0.02	17.48***	10.26***	26.30***	13.74***	8.84***	5.00***	7.26***
	(1.24)	(0.35)	(1.42)	(1.64)	(6.16)	(2.46)	(1.37)	(1.24)	(1.49)
R-squared	0.69	0.86	0.97	0.56	0.63	0.62	0.83	0.77	0.79
Panel B: Post-1985									
Population (log)	0.24	0.08*	0.00	-0.33	2.01**	-0.03	-0.28	-0.04	0.01
	(0.18)	(0.05)	(0.18)	(0.22)	(0.81)	(0.33)	(0.19)	(0.18)	(0.20)
Time=1996-2006	-0.37***	-0.25**	-1.80***	-6.50***	-23.30***	-7.14***	-2.25***	-1.51***	-2.18***
	(0.13)	(0.11)	(0.38)	(0.36)	(1.22)	(0.42)	(0.26)	(0.22)	(0.28)
Constant	-0.79	0.12	18.01***	11.00***	30.66***	14.55***	8.43***	4.91***	6.21***
	(1.23)	(0.28)	(1.40)	(1.58)	(5.68)	(2.38)	(1.39)	(1.25)	(1.44)
R-squared	0.69	0.86	0.97	0.59	0.68	0.64	0.82	0.76	0.77
Panel C: Annual Data									
Population (log)	0.21	0.05	-0.07	-0.32	1.92**	0.02	-0.14	-0.03	0.06
	(0.17)	(0.04)	(0.19)	(0.21)	(0.78)	(0.33)	(0.19)	(0.20)	(0.19)
Year = 1985	-0.41	-0.03	-0.80	-4.12***	-11.14***	-3.84***	-4.02***	-2.12***	-4.09***
	(0.25)	(0.19)	(0.73)	(0.56)	(2.10)	(0.68)	(0.52)	(0.52)	(0.65)
Year = 1996	-0.41	-0.17	-1.78**	-7.64***	-26.40***	-7.97***	-4.02***	-2.16***	-4.13***
	(0.25)	(0.18)	(0.72)	(0.56)	(2.09)	(0.68)	(0.53)	(0.53)	(0.65)
Year = 2006	-0.90***	-0.39**	-2.95***	-10.31***	-34.63***	-10.78***	-5.52***	-3.63***	-5.95***
	(0.30)	(0.18)	(0.76)	(0.57)	(2.10)	(0.71)	(0.56)	(0.53)	(0.68)
Constant	-0.24	0.40	19.09***	13.39***	38.59***	16.44***	9.94***	6.19***	8.77***
	(1.19)	(0.31)	(1.50)	(1.54)	(5.50)	(2.35)	(1.39)	(1.27)	(1.45)
R-squared	0.70	0.87	0.97	0.61	0.70	0.66	0.84	0.77	0.79
Observations	1,104	1,227	794	2,061	1,745	2,083	1,728	1,838	1,470
Number of villages	385	579	290	609	592	602	505	566	471

Notes: Robust standard errors in parentheses, estimated using the areg command in Stata 12. Significance levels shown are *** p<0.01, ** p<0.05, and * p<0.1. All distances are in kilometers.

Table 9: 2SLS results for public amenities on predicted village population and time

Dependent variable	Transport		Services			Markets		
Distance to nearest:	Road	Bus Stop	Bank	Electricity	Telephone	Public	Livestock	Private
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Post-1975								
Population (log)	-0.85	8.79	-36.05	-31.32*	-26.99*	-9.66**	-24.97	-2.23
	(1.41)	(12.28)	(33.81)	(16.03)	(14.39)	(4.26)	(34.22)	(2.35)
Time = 1985-2006	-0.39	-8.51**	-1.35	-4.72	-6.08	0.25	4.18	-1.41***
	(0.45)	(4.00)	(10.87)	(3.70)	(3.84)	(1.11)	(10.41)	(0.49)
Panel B: Post-1985								
Population (log)	-3.63	1.80	-24.01	-29.20	-22.39*	-6.26**	-121.31	-2.17
	(3.24)	(7.14)	(28.63)	(20.99)	(11.59)	(2.91)	(376.44)	(4.69)
Time = 1996-2006	-0.35	-4.98***	-9.60***	-7.78***	-13.48***	-1.26***	12.74	-2.26***
	(0.33)	(0.73)	(3.27)	(2.24)	(1.62)	(0.31)	(54.53)	(0.79)
Panel C: Annual Data								
Population (log)	-0.54	3.82	-28.27	-28.12**	-23.43**	-7.96**	-2.23	-2.04
	(1.36)	(5.54)	(25.16)	(13.36)	(10.18)	(3.35)	(6.73)	(2.17)
Year = 1985	-0.03	-4.96**	2.14	-0.22	2.55	0.65	0.22	0.05
	(0.56)	(2.29)	(8.89)	(3.47)	(3.37)	(1.06)	(1.99)	(0.64)
Year = 1996	0.10	-7.45***	1.02	0.44	-4.36	0.67	-2.01	-0.79
	(0.54)	(2.67)	(10.75)	(4.55)	(4.11)	(1.19)	(2.59)	(0.55)
Year = 2006	-1.50***	-8.71***	-16.18***	-15.98***	-18.93***	-2.14***	-6.12***	-3.53***
	(0.46)	(1.32)	(6.11)	(3.18)	(2.61)	(0.62)	(1.99)	(0.70)
Observations	1,377	1,683	843	1,113	1,483	2,209	990	1,031
Number of villages	393	482	318	348	451	594	287	352

Notes: Robust standard errors in parentheses, estimated using the xtivreg command in Stata 12. Significance levels shown are *** p<0.01, ** p<0.05, and * p<0.1. Population is the predicted value from first stage regressions for each panel of the type shown in Table 3, but for the specific sample shown for each column. All distances are in kilometers.

Table 9 (cont'd.): 2SLS results for public amenities on predicted village population and time

	Water			Schooling and Health			Religious Services		
Distance to nearest	Well	Borehole	Dam	Primary	Secondary	Clinic	Church	Mosque	Temple
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
Panel A: Post-1975									
Population (log)	-20.67	1.00	-0.55	-7.22*	-8.01	-2.81	-6.39	-3.78	-2.77
	(83.67)	(0.92)	(3.77)	(3.71)	(8.36)	(4.20)	(4.59)	(2.70)	(3.23)
Time = 1985-2006	5.05	-0.22	-1.72	-5.66***	-20.89***	-6.73***	-2.94***	-1.58**	-4.15***
	(22.88)	(0.19)	(1.17)	(1.11)	(3.27)	(1.39)	(1.11)	(0.69)	(0.79)
Panel B: Post-1985									
Population (log)	34.22	-0.54	-8.46	-8.58**	-19.14	-5.93	-5.99	-3.82	-4.10
	(225.48)	(0.79)	(6.82)	(4.04)	(12.16)	(4.02)	(5.11)	(2.69)	(3.12)
Time = 1996-2006	1.27	-0.34*	-2.62**	-6.37***	-23.07***	-6.80***	-2.26***	-1.58***	-2.43***
	(11.04)	(0.19)	(1.05)	(0.48)	(1.54)	(0.52)	(0.35)	(0.29)	(0.42)
Panel C: Annual Data									
Population (log)	3.99	-0.68	-2.88	-7.78**	-10.99	-3.97	-5.55	-3.27	-3.84
	(3.87)	(0.68)	(3.61)	(3.31)	(7.64)	(3.54)	(3.88)	(2.36)	(2.91)
Year = 1985	-1.85	0.06	0.37	-1.75	-5.97	-2.49*	-2.20*	-0.88	-2.90***
	(1.52)	(0.26)	(1.65)	(1.29)	(3.73)	(1.43)	(1.25)	(0.79)	(0.99)
Year = 1996	-2.01	-0.07	-0.78	-4.77***	-20.71***	-6.35***	-2.00	-0.85	-2.86***
	(1.66)	(0.25)	(1.41)	(1.45)	(3.97)	(1.63)	(1.36)	(0.83)	(1.02)
Year = 2006	-0.96**	-0.53**	-2.80***	-10.00***	-33.12***	-10.32***	-5.21***	-3.39***	-5.96***
	(0.46)	(0.24)	(0.81)	(0.74)	(2.42)	(0.86)	(0.63)	(0.52)	(0.73)
Observations	1,041	1,062	753	2,025	1,681	2,055	1,694	1,777	1,410
Number of villages	322	414	249	573	528	574	471	505	411

Notes: Robust standard errors in parentheses, estimated using the xtivreg command in Stata 12. Significance levels shown are *** p<0.01, ** p<0.05, and * p<0.1. Population is the predicted value from first stage regressions for each panel of the type shown in Table 3, but for the specific sample shown for each column. All distances are in kilometers.

ONLINE APPENDIX

QUESTIONNAIRE

BURKINA FASO
Ministère de l'Agriculture de l'Hydraulique et des Ressources Halieutiques

DIRECTION GENERALE DE LA PROMOTION DE L'ECONOMIE RURALE

Direction de la Prospective et des Statistiques Agricoles et Alimentaires

ENQUETE COMMUNAUTAIRE

Nº	Eléments d'identification	Nom	Code
1	Région		|____|____|
2	Province		|____|____|
3	Commune		|____|____|
4	Type de localité 1 = urbain 2 = rural		|____|
5	Village / secteur		|____|____|____|
6	Latitude		|____|____|____|____|____|____|
7	Longitude		|____|____|____|____|____|____|

Nom du contrôleur : _____|__C__|____|____|

Date de l'interview : |____|____| |____|____| |____|____|
Jourmoisannée

Nom et visa du superviseur :_____

Date de contrôle : |____|____| |____|____| |____|____|
Jourmoisannée
Résultat du contrôle :……..…|____|
(1= aucun problème ; 2= questionnaire corrigé ; 3= questionnaire repris)
Nom et prénom(s) de l'agent de saisie A :_____|____|____|____|

Nom et prénom(s) de l'agent de saisie B :_____|____|____|____|

A combien d'années remonte l'établissement du village :….. |____|____|____|____|

Le Village est-il un village de colonie : (1=Oui ;0=Non) :……|___|

I. IDENTITE DES REPONDANTS

N°	Catégorie	Nombre pour chaque catégorie		TOTAL*
		Homme	Femme	
I.1	Autorités gouvernementales/Représentants de l'administration	|____|____|	|____|____|	|____|____|
I.2	Ch de village	|____|____|	|____|____|	|____|____|
I.3	Délégués CVD	|____|____|	|____|____|	|____|____|
I.4	Chefs de terre	|____|____|	|____|____|	|____|____|
I.5	Chefs religieux (Imam, Pasteur, Prêtre….)	|____|____|	|____|____|	|____|____|
I.6	Responsables de Groupements/Associations	|____|____|	|____|____|	|____|____|
I.7	**TOTAL***	|____|____|	|____|____|	|____|____|

*A compléter après l'interview avec le groupe

II. COMPOSITION ACTUELLE DES COMMUNAUTES DU VILLAGE

N°	Questions	Réponse
II.1	Nombre approximatif d'autochtones revenus de la Côte d'Ivoire à cause de la crise ivoirienne	|____|____|____|____|
II.2	Nombre approximatif d'immigrants venant d'ailleurs	|____|____|____|____|
II.3	Nombre de groupes ethniques dans la communautédu village	|____|____|
II.4	Nombre de clans dans le village	|____|____|

III. **POPULATION DU VILLAGE**

NB : Pour cette partie, l'enquêteur devra se rendre à la préfecture ou à la mairie de la localité

N°	Questions		Réponse
III.1	Existencedes documents du recensement de 2006 **(1=Oui ;0=Non)**		|____|
III.2	Population totale en 2006		|____|____|____|____|____|____|____|
III.3	Population de plus de 15 ans	Homme	|____|____|____|____|____|____|____|
III.4		Femme	|____|____|____|____|____|____|____|
III.5	Population de moins de 15 ans	Homme	|____|____|____|____|____|____|____|
III.6		Femme	|____|____|____|____|____|____|____|
III.7	Existence des documents du recensement de 1996 **(1=Oui ;0=Non)**		|____|
III.8	Population totale en 1996		|____|____|____|____|____|____|____|
III.9	Population de plus de 15 ans	Homme	|____|____|____|____|____|____|____|
III.10		Femme	|____|____|____|____|____|____|____|
III.11	Population de moins de 15 ans	Homme	|____|____|____|____|____|____|____|
III.12		Femme	|____|____|____|____|____|____|____|
III.13	Existence des documents du recensement de 1985 **(1=Oui ;0=Non)**		|____|
III.14	Population totale en 1985		|____|____|____|____|____|____|____|
III.15	Population de plus de 15 ans	Homme	|____|____|____|____|____|____|____|
III.16		Femme	|____|____|____|____|____|____|____|
III.17	Population de moins de 15 ans	Homme	|____|____|____|____|____|____|____|
III.18		Femme	|____|____|____|____|____|____|____|

IV.VISITE D'UN OFFICIEL DE LA VULGARISATION AGRICOLE

N°	Questions	Réponse
IV.1	Quand a été la première visite d'un vulgarisateur à votre communauté ? *(Inscrire l'année ou xxxx si jamais)*	|____|____|____|____|
IV.2	Quand est-ce quela vulgarisation de proximité (ancienne formule)a cessé ?*(Inscrire l'année ou xxxx si jamais)*	|____|____|____|____|
IV.3	Quand est-ce que la vulgarisation nouvelleformule a commencé? *(Inscrire l'année ou xxxx si jamais)*	|____|____|____|____|
IV.4	Quand a été la dernière visite d'un vulgarisateur à votre communauté ? *(Inscrire l'année ou xxxx si jamais)*	|____|____|____|____|
IV.5	Combien de visites avez vous reçus au cours des 12 derniers mois ? *(Inscrire l'année ou xxxx si jamais)*	|____|____|____|____|

V. INFRASTRUCTURES CENTRALES : DISTANCES ET CHANGEMENTS

N°	Questions	Réponse	
		Distance(en km)	Année d'établissement
V.1	**Distance entre le village et l'administration centrale (pour les registres des naissances)**		
V.1.1	La situation actuelle	|____|____|____|	|____|____|____|____|
V.1.2	La situation précédente	|____|____|____|	|____|____|____|____|
V.1.3	La situation antécédente	|____|____|____|	|____|____|____|____|
V.2	**Distance entre le village et la route praticable par car ou camion toute l'année**		
V.2.1	La situation actuelle	|____|____|____|	|____|____|____|____|
V.2.2	La situation précédente	|____|____|____|	|____|____|____|____|
V.2.3	La situation antécédente	|____|____|____|	|____|____|____|____|
V.3	**Distance entre le village et la route praticable par car ou camion seulement une partie de l'année**		
V.3.1	La situation actuelle	|____|____|____|	|____|____|____|____|
V.3.2	La situation précédente	|____|____|____|	|____|____|____|____|
V.3.3	La situation antécédente	|____|____|____|	|____|____|____|____|
V.4	**Distance entre le village et l'arrêt d'autocar/taxi brousse rural**		
V.4.1	La situation actuelle	|____|____|____|	|____|____|____|____|
V.4.2	La situation précédente	|____|____|____|	|____|____|____|____|
V.4.3	La situation antécédente	|____|____|____|	|____|____|____|____|
V.5	**Distance entre le village et le bureau des caisses populaires**		
V.5.1	La situation actuelle	|____|____|____|	|____|____|____|____|
V.5.2	La situation précédente	|____|____|____|	|____|____|____|____|
V.5.3	La situation antécédente	|____|____|____|	|____|____|____|____|

V.6	**Distance entre le village et la localité avec distribution d'électricité**		
V.6.1	La situation actuelle	|____|____|____|	|____|____|____|____|
V.6.2	La situation précédente	|____|____|____|	|____|____|____|____|
V.6.3	La situation antécédente	|____|____|____|	|____|____|____|____|
V.7	**Distance entre le village et la localité avecle téléphone fixe**		
V.7.1	La situation actuelle	|____|____|____|	|____|____|____|____|
V.7.2	La situation précédente	|____|____|____|	|____|____|____|____|
V.7.3	La situation antécédente	|____|____|____|	|____|____|____|____|
V.8	**Distance entre le village et la localité avec la téléphonie mobile**		
V.8.1	La situation actuelle	|____|____|____|	|____|____|____|____|
V.8.2	La situation précédente	|____|____|____|	|____|____|____|____|
V.8.3	La situation antécédente	|____|____|____|	|____|____|____|____|

VI.MARCHES VILLAGEOIS

N°	Questions	Réponse		
VI.1	**FREQUENCEDU MARCHE GENERAL**			
		Distance(en km)	**Fréquence** *1=chaque jour* *2 = tous les 3 jours* *3 = tous les 4 jours* *4 = chaque semaine* *5 = occasionnel*	**Année d'établissement**
VI.1.1	La situation actuelle	|____|____|____|	|____|	|____|____|____|____|
VI.1.2	La situation précédente	|____|____|____|	|____|	|____|____|____|____|
VI.1.3	La situation antécédente	|____|____|____|	|____|	|____|____|____|____|
VI.2	**TYPE DE SOURCE POUR ACCES A L'EAU DANS LE MARCHE GENERAL**			
			Type de source d'eau *1=robinet* *2 = borne fontaine* *3 = forage* *4 = puits* *5 = aucune*	**Année d'établissement**
VI.2.1	La situation actuelle		|____|-|____|-|____|	|____|____|____|____|
VI.2.2	La situation précédente		|____|-|____|-|____|	|____|____|____|____|
VI.2.3	La situation antécédente		|____|-|____|-|____|	|____|____|____|____|
VI.3	**HANGARS DANS LE MARCHEGENERAL**			
			Type de hangar *1=individuel* *2 = collectif* *3 = aucun*	**Année d'établissement**
VI.3.1	La situation actuelle		|____|-|____|	|____|____|____|____|
VI.3.2	La situation précédente		|____|-|____|	|____|____|____|____|
VI.3.3	La situation antécédente		|____|-|____|	|____|____|____|____|

VI.4	**ACCES A L'ELECTRICITE DANS LE MARCHE GENERAL**			
			Disponibilité *1=permanente* *2 = une partie de la journée* *3 = aucune*	**Année d'établissement**
VI.4.1	La situation actuelle		|____|	|____|____|____|____|
VI.4.2	La situation précédente		|____|	|____|____|____|____|
VI.4.3	La situation antécédente		|____|	|____|____|____|____|
VI.5	**FRAIS (NIVEAU DES TAXES DE MARCHE GENERAL)**			
		Période *1=chaque jour* *2 = chaque semaine* *3 = chaque mois* *4 = chaque année* *5 = chaque marché*	**Montant par période**	**Année d'établissement**
VI.5.1	La situation actuelle	|____|	|____|____|____|____|	|____|____|____|____|
VI.5.2	La situation précédente	|____|	|____|____|____|____|	|____|____|____|____|
VI.5.3	La situation antécédente	|____|	|____|____|____|____|	|____|____|____|____|
VI.6	**FREQUENCEDU MARCHE A BETAIL**			
		Distance(en km)	**Fréquence** *1=chaque jour* *2 = tous les 3 jours* *3 = tous les 4 jours* *4 = chaque semaine* *5 = occasionnel*	**Année d'établissement**
VI.6.1	La situation actuelle	|____|____|____|	|____|	|____|____|____|____|
VI.6.2	La situation précédente	|____|____|____|	|____|	|____|____|____|____|
VI.6.3	La situation antécédente	|____|____|____|	|____|	|____|____|____|____|

VI.7	**TYPE DE SOURCE POUR ACCES A L'EAU DANS LE MARCHE A BETAIL**			
			Type de source d'eau *1=robinet* *2 = borne fontaine* *3 = forage* *4 = puits* *5 = aucune*	**Année d'établissement**
VI.7.1	La situation actuelle		|____|-|____|-|____|	|____|____|____|____|
VI.7.2	La situation précédente		|____|-|____|-|____|	|____|____|____|____|
VI.7.3	La situation antécédente		|____|-|____|-|____|	|____|____|____|____|
VI.8	**HANGARS DANS LE MARCHE A BETAIL**			
			Type de hangar *1=individuel* *2 = collectif* *3 = aucun*	**Année d'établissement**
VI.8.1	La situation actuelle		|____|-|____|	|____|____|____|____|
VI.8.2	La situation précédente		|____|-|____|	|____|____|____|____|
VI.8.3	La situation antécédente		|____|-|____|	|____|____|____|____|
VI.9	**ACCES A L'ELECTRICITE DANS LE MARCHE A BETAIL**			
			Disponibilité *1=permanente* *2 = une partie de la journée* *3 = aucune*	**Année d'établissement**
VI.9.1	La situation actuelle		|____|	|____|____|____|____|
VI.9.2	La situation précédente		|____|	|____|____|____|____|
VI.9.3	La situation antécédente		|____|	|____|____|____|____|
VI.10	**FRAIS (NIVEAU DES TAXES DE MARCHE) A BETAIL**			
		Période *1=chaque jour* *2 = chaque semaine* *3 = chaque mois* *4 = chaque année* *5 = chaque marché*	**Montant par période**	**Année d'établissement**
VI.10.1	La situation actuelle	|____|	|____|____|____|____|	|____|____|____|____|
VI.10.2	La situation précédente	|____|	|____|____|____|____|	|____|____|____|____|
VI.10.3	La situation antécédente	|____|	|____|____|____|____|	|____|____|____|____|

VII.INFRASTRUCTURE DU VILLAGE

N°	Questions	Réponse		
		Distance	**Nombre**	**Année d'établissement**
VII.1	**Distance entre le village et les boutiques pour achat des provisions divers (sel, thé, sucre, etc.)**			
VII.1.1	La situation actuelle	|____|____|	|____|____|	|____|____|____|____|
VII.1.2	La situation précédente	|____|____|	|____|____|	|____|____|____|____|
VII.1.3	La situation antécédente	|____|____|	|____|____|	|____|____|____|____|
VII.2	**Distance entre le village et les puits collectifs pour l'eau potable**			
VII.2.1	La situation actuelle	|____|____|	|____|____|	|____|____|____|____|
VII.2.2	La situation précédente	|____|____|	|____|____|	|____|____|____|____|
VII.2.3	La situation antécédente	|____|____|	|____|____|	|____|____|____|____|
VII.3	**Distance entre le village et le puits à grand diamètre**			
VII.3.1	La situation actuelle	|____|____|	|____|____|	|____|____|____|____|
VII.3.2	La situation précédente	|____|____|	|____|____|	|____|____|____|____|
VII.3.3	La situation antécédente	|____|____|	|____|____|	|____|____|____|____|
VII.4	**Distance entre le village et le forage collectif pour l'eau potable**			
VII.4.1	La situation actuelle	|____|____|	|____|____|	|____|____|____|____|
VII.4.2	La situation précédente	|____|____|	|____|____|	|____|____|____|____|
VII.4.3	La situation antécédente	|____|____|	|____|____|	|____|____|____|____|

VII.5	**Distance entre le village et le Barrage collectif**			
VII.5.1	La situation actuelle	|____|____|	|____|____|	|____|____|____|____|
VII.5.2	La situation précédente	|____|____|	|____|____|	|____|____|____|____|
VII.5.3	La situation antécédente	|____|____|	|____|____|	|____|____|____|____|
VII.6	**Pont routier construit par le village**			
VII.6.1	La situation actuelle		|____|____|	|____|____|____|____|
VII.6.2	La situation précédente		|____|____|	|____|____|____|____|
VII.6.3	La situation antécédente		|____|____|	|____|____|____|____|
VII.7	**Passage piétonnier construit par le village**			
VII.7.1	La situation actuelle		|____|____|	|____|____|____|____|
VII.7.2	La situation précédente		|____|____|	|____|____|____|____|
VII.7.3	La situation antécédente		|____|____|	|____|____|____|____|
VII.8	**Magasin(utilisable) de coopérative agricole, d'ONG ou de GroupementVillageois**			
VII.8.1	La situation actuelle		|____|____|	|____|____|____|____|
VII.8.2	La situation précédente		|____|____|	|____|____|____|____|
VII.8.3	La situation antécédente		|____|____|	|____|____|____|____|

VIII. DROITS FONCIERS SUR LES TERRES DE CULTURE

N°	Questions	Réponse	
VIII.1	**Type de droit appliquée pour les terres de culture** *(si la réponse est non, mettre des croix à année de début d'application)*		
		Type de droit appliquée (1=Oui ;0=Non)	**Année de début d'application**
VIII.1.1	Propriété individuelle	|____|	|____|____|____|____|
VIII.1.2	Propriété collective-familiale	|____|	|____|____|____|____|
VIII.1.3	Propriété collective-communautaire	|____|	|____|____|____|____|
VIII.2	**Location, vente et prêts de terres de culture** *(si la réponse est non, mettre des croix à année de début d'application)*		
		Possibilité de transaction (1=Oui ;0=Non)	**Année de début d'application**
VIII.2.1	Est-ce que la terre peut-être louée ?	|____|	|____|____|____|____|
VIII.2.2	Est-ce que la terre peut-être vendue ?	|____|	|____|____|____|____|
VIII.2.3	Est-ce que la terre peut-être prêtée ?	|____|	|____|____|____|____|
VIII.3	**Est-ce qu'il y a des terres de culture qui ont étés louées ?** *(si non à la question VIII.2.1, mettre des croix dans les bacs et passer à la question suivante)*		
		Location de terre (1=Oui ;0=Non)	**Année de début d'application**
VIII.3.1	Louées à une personne autochtone	|____|	|____|____|____|____|
VIII.3.2	Louées à une personne étrangère	|____|	|____|____|____|____|
VIII.4	**A qui devrait-on demander permission pour louer ses terres?** *(cette question devra être toujours posée quelque soit la réponse de la question précédente)*		
		Personnes ressources *1=chef de famille* *2= chef de terre* *3 = conseil élu par la communauté* *4 = conseil élu par le gouvernement* *5 = aucune permission*	**Année de début d'application**
VIII.4.1	La situation actuelle	|____|-|____|-|____|	|____|____|____|____|
VIII.4.2	La situation précédente	|____|-|____|-|____|	|____|____|____|____|
VIII.4.3	La situation antécédente	|____|-|____|-|____|	|____|____|____|____|

VIII.5	**Est-ce qu'il y a des terres de culture qui ont étés vendues ?** *(si non à la question VIII.2.2, mettre des croix dans les bacs et passer à la question suivante)*		
		Ventes de terre (1=Oui ;0=Non)	**Année de début d'application**
VIII.5.1	Vendues àune personne autochtone ?	|____|	|____|____|____|____|
VIII.5.2	Vendues à une personne étrangère?	|____|	|____|____|____|____|
VIII.6	**A qui devrait-on demander permission pour vendre ses terres?** *(cette question devra être toujours posée quelque soit la réponse de la question précédente)*		
		Personnes ressources *1=chef de famille* *2= chef de terre* *3 = conseil élu par la communauté* *4 = conseil élu par le gouvernement* *5 = aucune permission*	Année de début d'application
VIII.6.1	La situation actuelle	|____|-|____|-|____|	|____|____|____|____|
VIII.6.2	La situation précédente	|____|-|____|-|____|	|____|____|____|____|
VIII.6.3	La situation antécédente	|____|-|____|-|____|	|____|____|____|____|
VIII.7	**Est-ce qu'il y a des terres de culture qui ont étés prêtées ?** *(si non à la question VIII.2.3, mettre des croix dans les bacs et passer à la question suivante)*		
		Prêts de terre (1=Oui ;0=Non)	**Année de début d'application**
VIII.7.1	Prêtées à une personne autochtone	|____|	|____|____|____|____|
VIII.7.2	Prêtées à une personne étrangère	|____|	|____|____|____|____|
VIII.8	**A qui devrait-on demander permission pour prêter ses terres?** *(cette question devra être toujours posée quelque soit la réponse de la question précédente)*		
		Personnes ressources *1=chef de famille* *2= chef de terre* *3 = conseil élu par la communauté* *4 = conseil élu par le gouvernement* *5 = aucune permission*	Année de début d'application
VIII.8.1	La situation actuelle	|____|-|____|-|____|	|____|____|____|____|
VIII.8.2	La situation précédente	|____|-|____|-|____|	|____|____|____|____|
VIII.8.3	La situation antécédente	|____|-|____|-|____|	|____|____|____|____|

VIII.9	**A qui devrait-on s'adresser pour résoudre un conflit foncier pour l'usage des terres de culture?**		
		Personnes ressources *1=chef de terre* *2 = chef ou conseil élu par la communauté* *3 = chef ou conseil nommé par le gouvernement* *4 = autre type d'autorité* *5 = aucune autorité*	Année de début d'application
VIII.9.1	La situation actuelle	|____|-|____|-|____|	|____|____|____|____|
VIII.9.2	La situation précédente	|____|-|____|-|____|	|____|____|____|____|
VIII.9.3	La situation antécédente	|____|-|____|-|____|	|____|____|____|____|
VIII.10	**Quelles sont les modes de propriété des terres de pâturages dans cette communauté** *(s'il n'existe pas de terre de pâturage, mettre des croix dans les bacs et passer à la question suivante)*		
		Personnes ressources *1=propriété individuelle* *2 = propriété collective-familiale* *3 = propriété collective-lignagère* *4 = propriété collective-communautaire* *5 = autre*	**Année de début d'application**
VIII.10.1	La situation actuelle	|____|-|____|-|____|	|____|____|____|____|
VIII.10.2	La situation précédente	|____|-|____|-|____|	|____|____|____|____|
VIII.10.3	La situation antécédente	|____|-|____|-|____|	|____|____|____|____|
VIII.11	**Combien de pistes à bétail y a-t-il dans le village** *(s'il n'existe pas de pistes à bétail, mettre des croix dans les bacs et passer à la question suivante)*		
		Nombre	**Année de début d'application**
VIII.11.1	La situation actuelle	|____|____|	|____|____|____|____|
VIII.11.2	La situation précédente	|____|____|	|____|____|____|____|
VIII.11.3	La situation antécédente	|____|____|	|____|____|____|____|

IX.DROITS FONCIERS POUR LES TERRES DE PATURAGE

N°	Questions	Réponse	
IX.1	**Existe-t-il des terresréservées pour le pâturage ?** *(si la réponse est non pour une situation donnée, mettre des croix à année d'établissement)*		
		Existence de pâturage (1=Oui ;0=Non)	**Année d'établissement**
IX.1.1	La situation actuelle	|____|	|____|____|____|____|
IX.1.2	La situation précédente	|____|	|____|____|____|____|
IX.1.3	La situation antécédente	|____|	|____|____|____|____|
IX.2	**Quelles sont les voies d'accès aux pâturages ?** *(si la réponse est 2 (tout autre piste), mettre des croix à année d'établissement)*		
IX.2.1		**Voies d'accès** *1=pistes à bétail 2 = tout autre piste*	**Année d'établissement**
IX.2.2	La situation actuelle	|____|	|____|____|____|____|
IX.2.3	La situation précédente	|____|	|____|____|____|____|
	La situation antécédente	|____|	|____|____|____|____|

IX.3	**Quels moyens existent pour limiter l'accès aux terres de pâturages ?** *(si la réponse est non pour une situation donnée à la question IX.1, mettre des croix dans la situation correspondante à cette question ci)*		
		Moyens de paiement *1=paiement d'une taxe par animal* *2 = paiement d'un autre type de taxe* *3 = contrôle du nombre d'animaux* *4 = accès illimité pour autochtones* *5= accès illimité pour résidents* *6= aucune restriction*	**Année d'établissement**
IX.3.1	La situation actuelle	|____|-|____|-|____|	|____|____|____|____|
IX.3.2	La situation précédente	|____|-|____|-|____|	|____|____|____|____|
IX.3.3	La situation antécédente	|____|-|____|-|____|	|____|____|____|____|
IX.4	**Qui est responsable pour gérer l'accès aux terres de pâturages ?**		
		Personnes ressources *1= chef de terre* *2 = chef ou conseil élu par la communauté* *3 = chef ou conseil nommé par le gouvernement* *4 = autre type d'autorité* *5 = aucune autorité*	**Année d'établissement**
IX.4.1	La situation actuelle	|____|-|____|-|____|	|____|____|____|____|
IX.4.2	La situation précédente	|____|-|____|-|____|	|____|____|____|____|
IX.4.3	La situation antécédente	|____|-|____|-|____|	|____|____|____|____|

X.DROITS D'UTILISATION DES FORETS (POUR LE BOIS, LES FRUITS, LA CHASSE ETC.)

N°	Questions	Réponse	
X.1	**Existe-t-il des forêts dans votre communauté ?** *(si la réponse est non pour une situation donnée, mettre des croix à année d'établissement)*		
		Existence de forêts (1=Oui ;0=Non)	**Année d'établissement**
X.1.1	La situation actuelle	|____|	|____|____|____|____|
X.1.2	La situation précédente	|____|	|____|____|____|____|
X.1.3	La situation antécédente	|____|	|____|____|____|____|
X.2	**Est-ce qu'il existe des moyens pour limiter l'accès aux forets ?** *(si la réponse est non pour une situation donnée à la question X.1, mettre des croix dans la situation correspondante à cette question ci)*		
		Moyens de paiement *1=paiement d'une taxe par unité de bois 2 = paiement d'une taxe par autre moyen 3 = contrôle direct des entrées et sorties 4 = accès illimité pour autochtones 5= accès illimité pour résidents 6= aucune restriction*	**Année d'établissement**
X.2.1	La situation actuelle	|____|-|____|-|____|	|____|____|____|____|
X.2.2	La situation précédente	|____|-|____|-|____|	|____|____|____|____|
X.2.3	La situation antécédente	|____|-|____|-|____|	|____|____|____|____|
X.3	**Qui est responsable de la gestion de l'accès aux forets ?**		
		Personnes ressources *1= chef de terre 2 = chef ou conseil élu par la communauté 3 = chef ou conseil nommé par le gouvernement 4 = autre type d'autorité 5 = aucune autorité*	**Année d'établissement**
X.3.1	La situation actuelle	|____|-|____|-|____|	|____|____|____|____|
X.3.2	La situation précédente	|____|-|____|-|____|	|____|____|____|____|
X.3.3	La situation antécédente	|____|-|____|-|____|	|____|____|____|____|

XI.INFRASTRUCTURE D'EDUCATION ET DE SANTE

N°	Questions	Réponse	
		Distance	**Année d'établissement**
XI.1	**Distance entre le village et l'école primaire la plus fréquentée par les enfants du village**		
XI.1.1	La situation actuelle	|____|____|____|	|____|____|____|____|
XI.1.2	La situation précédente	|____|____|____|	|____|____|____|____|
XI.1.3	La situation antécédente	|____|____|____|	|____|____|____|____|
XI.2	**Distance entre le village et l'école secondaire la plus fréquentée par les enfants du village**		
XI.2.1	La situation actuelle	|____|____|____|	|____|____|____|____|
XI.2.2	La situation précédente	|____|____|____|	|____|____|____|____|
XI.2.3	La situation antécédente	|____|____|____|	|____|____|____|____|
XI.3	**Distance entre le village et le centre de santé le plus fréquenté par la population du village**		
XI.3.1	La situation actuelle	|____|____|____|	|____|____|____|____|
XI.3.2	La situation précédente	|____|____|____|	|____|____|____|____|
XI.3.3	La situation antécédente	|____|____|____|	|____|____|____|____|

XII.INFRASTRUCTURE RELIGIEUSES

N°	Questions	Réponse	
		Distance	**Année d'établissement**
XII.1	**Distance entre le village etl'église la plus fréquentée par la population du village**		
XII.1.1	La situation actuelle	|____|____|____|	|____|____|____|____|
XII.1.2	La situation précédente	|____|____|____|	|____|____|____|____|
XII.1.3	La situation antécédente	|____|____|____|	|____|____|____|____|
XII.2	**Distance entre le village et la mosquée la plus fréquentée par la population du village**		
XII.2.1	La situation actuelle	|____|____|____|	|____|____|____|____|
XII.2.2	La situation précédente	|____|____|____|	|____|____|____|____|
XII.2.3	La situation antécédente	|____|____|____|	|____|____|____|____|
XII.3	**Distance entre le village et le temple le plus fréquenté par la population du village**		
XII.3.1	La situation actuelle	|____|____|____|	|____|____|____|____|
XII.3.2	La situation précédente	|____|____|____|	|____|____|____|____|
XII.3.3	La situation antécédente	|____|____|____|	|____|____|____|____|