Measuring Adoption of SWM/fertilizer technologies and Evaluating Impacts: Current Knowledge and Data Issues

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Background: Substantial progress has been made in the development and testing of potentially profitable technologies for improved soil and water management in Sub-Saharan Africa (Buresh 1997, Sanders et al. 1996). There is also some evidence that particular types of soil and water management technologies (e.g. rock lines, branch barriers, small dikes, vegetative bands, compost pits) are beginning adopted by increasing numbers of farmers in Africa, often in conjunction with increased use of purchased inputs such as improved seeds and inorganic fertilizers (USAID 2002, Barrett et al. 2002). However, the full extent of this adoption remains uncertain due to inconsistent use of terminology to identify practices adopted, inadequate attention to assessing the quality of adoption (i.e., correct use of techniques) and a failure to report dis-adoption over time (e.g. when a special development project ends). Furthermore, there has been no systematic effort to collect either quantitative or qualitative information on the yield and income impacts of SWM adoption, forcing analysts to rely on anecdotes drawing on the experiences of a very small (and probably a-typical) group of farmers who have kept records of changes in agricultural productivity following their adoption of SWM practices (see Kelly 2000 for a few examples).

Most SWM practices are recommended because they conserve limited resources (soil and water) while simultaneously increasing agricultural productivity and incomes. Many practices have been recommended as viable alternatives to high-external-input approaches that have not been adopted by poor farmers or those in highly risky production environments--an important target group given growing concerns about reducing rural poverty in SSA (USAID 2000). Unfortunately, after more than a decade of SWM projects implemented by a variety of institutions (e.g., NGOs, research centers, extension services), we still have a poor understanding of how many and what type of farmers have adopted, what percent of cultivated area has been affected, and what the yield and income impacts have been. Over time it has become increasingly difficult to defend budgets for SWM programs given the lack of solid evidence that such investments are contributing to agricultural productivity and income growth.

Objectives and Organization: The primary objectives of this paper are (1) to critically evaluate current SWM monitoring and evaluation practices and (2) to offer concrete recommendations on relatively low-cost approaches to improved SWM monitoring. To accomplish this we draw primarily on experiences in the natural resource management program of the *Office de la Haute Vallée du Niger* (OHVN) in Mali, integrating information from other sources and experiences when possible. The end product of this effort is a set of data collection instruments and implementation procedures that will be tested by the authors and OHVN collaborators during 2003.

The paper begins with an aggregate view of the state of SWM adoption in the OHVN based on information currently available from OHVN and external sources. This is followed by a description and critique of OHVN's existing monitoring activities. The next section describes proposed changes in the OHVN monitoring system and the implementation plan developed jointly by the authors and OHVN staff. The paper ends with some thoughts on the relevance of this OHVN experience for other SWM programs and other countries.

SWM in the OHVN: In the late 1980s and early 1990s the OHVN underwent a number of important changes:

- The parastatal was restructured to
  - Improve the quality of extension services
  - Move credit and marketing activities to the private sector
- A high profile was given to the promotion of SWM practices
- A high priority was given to development of ural enterprises and institutions
- Funds were allocated for the construction and maintenance of rural roads

USAID was an important donor during this period, providing strong support for the SWM program and other support activities. The OHVN approach to soil and water management has been to promote a broad menu of diverse practices, allowing farmers to select from the menu according to their perceived needs and capacity to adopt. OHVN has promoted SWM practices most strongly among farmers growing profitable cash crops (particularly cotton) because this permits simultaneous investments in animal traction and the use of purchased inputs such as fertilizers and improved seeds. OHVN also believes that there needs to be an economic incentive to adopt SWM practices and feels that the incentive for farmers growing cotton is much greater than that for farmers growing only traditional cereal crops (personal communications from various OHVN staff).

Aggregate production data during the 1990s show considerable growth in both area cultivated and production of most crops, but there is a disappointing lack of growth in yields (Table 1).[1] The lack of aggregate yield growth is particularly surprising given that the OHVN database suggests rapid growth in the adoption of SWM practices (Table 2). Various rapid appraisals also suggest that aggregate yields should be increasing as they report that the combination of cotton expansion and SWM adoption has moved a significant number of OHVN producers from semi-subsistence modes of production to diversified, revenue-generating farms where yields are increasing and land degradation is slowing (refs..Kelly 2000, OHVN 1999?).

Historical Overview of SWM Monitoring and Evaluation: Unfortunately, the manner in which OHVN monitors its SWM program makes it difficult to evaluate the extent to which SWM adoption has contributed to improved yields and incomes among individual adopters and in the aggregate. Information reported in Table 2 is the principal means of monitoring SWM adoption. This information on physical units of SWM practices adopted is supplemented with information on numbers of farmers and villages having adopted at least one SWM practice during the period under consideration (Table 3). The information comes primarily from records kept by extension personnel,

[1]Data for Tables 1 and 2 are currently being updated through 2001.

supplemented with an occasional survey (as was done in 1999). There are a number of weaknesses with this system of monitoring:

- Lack of attention to dis-adoption (e.g., failure to maintain or use a SWM practice after initial adoption);
- Failure to evaluate the quality of adoption (e.g., are rock lines constructed properly, are compost pits maintained correctly);
- Failure to report on the relative importance of adoption patterns (e.g., percent of farmers, of villages, or of cultivated area affected);

The growing disconnect between the rapid growth in SWM adoption statistics in the late 1990s and the stagnant or declining aggregate yields for principal crops in the zone leads one to ask if the promotion of SWM practices is making the anticipated contribution to agricultural productivity and incomes in the zone:

- Are farmers who adopt SWM practices increasing yields and incomes?
- If not, why not?
- If so, why are these increases not being reflected in aggregate yield statistics for the zone?
- Too few adopters?
- Adopters too concentrated in small areas to affect aggregate statistics?
- Statistical methods used to estimate aggregate yields inaccurate?[2]

OHVN has not completely ignored the issue of impact. During rapid appraisal missions farmers having adopted SWM practices often present information on yield and production changes experienced since they first adopted a key SWM practice such as a contour rock line (Annex 1) and OHVN occasionally prepares reports using data on one or two farmers to illustrate potential impacts (OHVN May 1992 and December 1999) . Unfortunately, this information comes from personal records kept by some of the more ambitious extension agents (CAP) or village *animateurs* rather than from a systematic data collection activity. Consequently, the information remains anecdotal providing a picture of what is possible with SWM adoption for individual farmers but not offering much insight about what has been accomplished in general.

In 1999 OHVN supplemented their annual monitoring efforts with a large farm survey designed to capture a picture of the level of SWM adoption at a point in time. The 1999 data in Table 2 and all the data in Table 3 are drawn from this survey rather than from the annual reporting by extension agents. The strength of the survey approach is that it captures adoption by individuals who did not work directly with the extension services (farmers, for example, who saw their neighbors successfully adopt a particular practice and attempted to copy what they saw). The weakness of the

[2] OHVN has had problems with their crop estimates for cotton in recent years with very large differences between estimated and actual harvests. As cotton is the focus of OHVN crop production estimates and the sample for cereals is much smaller, there is a strong possibility of measurement and sampling errors producing inaccurate yield estimates for non-cotton crops.

survey was that interviewers simply asked farmers to list their practices; there was no effort to verify the reports in terms of quantity or quality. Recent field visits by the authors suggest that some farmers are not very precise in their understanding of the SWM terminology and practices (reporting a line of rocks placed around a field as a "rock line", for example, even though it has no anti-erosion function). The strength of the 1999 OHVN survey was that it represented a full census of all households in the OHVN zone rather than a random sample. Because the OHVN covers a vast area with multiple agroecological environments and, consequently, high variability in the effort made to promote SWM practices (which are targeted to farmers most likely to adopt), it is extremely difficult to design a random sample capable of capturing a representative picture of SWM adoption. The difficulties became apparent in the mid-1990s when INSAH undertook a survey in the zone.

INSAH decided to use an area sampling frame. There was no attempt to stratify the sample. The OHVN zone was divided into areas; areas were randomly selected and farm households located in the selected areas were interviewed. This entirely random process led to the selection of very few areas where there had even been an effort to promote SWM technologies and very little was learned about SWM adoption in the OHVN (INSAH 2000?). Although some additional survey work was done using a different sampling method, the number of observations on SWM adoption remained low, providing little new information on the extent of SWM adoption and impacts.

Although we have not examined other SWM monitoring systems in-depth, the dearth of written reports (either published or unpublished) addressing the issue of aggregate levels of adoption and impacts suggests to us that this relatively bleak history of monitoring SWM adoption and impacts in the OHVN is typical of SWM monitoring throughout the Sahel. There are useful reports on the potential of these technologies to increase yields based on individual farmer experiences or results of on-farm trials (Sanders et al. 1996, Buresh et al. 1997, Yanggen et al. 1995), but very sparse information on numbers of farmers adopting and what that means for increases in aggregate production and yields.

Improving SWM Monitoring and Evaluation: A number of characteristics of SWM programs such as that in the OHVN make them difficult to monitor.

- The broad menu of SWM options often means that it is difficult to
  - Find adequate numbers of cases to assess impacts of individual practices
  - Isolate the impacts of each practice adopted when several are used on the same farm or plot
- The impact of many SWM practices is realized incrementally overtime rather than in a single agricultural season;
- It is difficult to quantify the full range of impacts because many SWM practices affect productivity in a variety of farm enterprises:
  - Different field crops,
  - Tree crops,
  - Livestock activities
- Many themes promoted only have relevance in particular circumstances (e.g., anti-erosion barriers), making it difficult to interpret statistics on rates of adoption:

  - Do low rates reflect low need or
  - Inadequate adoption?
- When measuring impacts, it is often difficult to identify and quantify the "base" situation:
  - Does one compare yields after SWM adoption with those the season before adoption?
  - With an average of several seasons before adoption?
  - With an estimated scenario of what would have happened without adoption?

The list could go on, but even with the limited number of points raised above, one realizes that monitoring SWM adoption and impacts is a daunting task. We believe the solution is to make marginal adjustments in the current system of monitoring that shift the focus from counting physical units of adoption to one that evaluates yield and income impacts. The challenge is in designing a system that can be implemented by OHVN (or other such programs) using existing human and financial resources. In making recommendations for improvements, we focus on eliminating the key weaknesses of the current system and drawing on the key strengths.

Key weaknesses:

- Apparent dis-connect between aggregate yield trends and rates of SWM adoption
- Counting physical units with no attention to quality of implementation or dis-adoption
- Absence of longitudinal data on changes in yields following SWM adoption
- Absence of longitudinal data on yield trends if no SWM adoption takes place

Key strengths:

- Interest on the part of OHVN management in better understanding both farm-level and aggregate impacts of SWM adoption
- Growing number of literate village *animateur* capable of keeping records
- In-house data entry and analysis capacity

Overview of Data Collection and Analysis Procedures Recommended: Annex 2 contains a sample of the proposed data collection instrument, which includes three parts:

- A map of the farm (copied on paper by the interviewer from a map sketched by the farmer on the ground);
- General descriptive information about the farm enterprise and its resource base;
- A form to collect input/output data on each cultivated plot.

General instructions on the use of the data collection instruments (in French) are included in the annex. There are also two sample farm maps and one copy of the form for collecting plot-level data, which has been filled out using information from field-testing. During the first interview with the participating farmer, the interviewer asks the farmer to sketch a picture of his farm, showing the placement of the house, well (or other water sources), garden plots, crop plots, orchards/wood lots, fallow land, compost pits, animal pens, etc. Plots that have benefited from NRM practices are identified and physical structures (e.g., rock lines, vegetative bands) on these plots are drawn. Watercourses that cause erosion are also sketched on the plot, with the direction of the water flow indicated. The interviewer numbers all of the fields on the map and uses these numbers as identifiers when filling in the plot-level input/output data. The same numbers will be used to identify plots in subsequent years, enabling one to track changes in crops and yields over time for the same plot of land. This is particularly important for plots benefiting from anti-erosion practices.

The instruments for collection of descriptive and resource information on the farm/household and that for collection of input/output data on each plot are straightforward and should be easily understood given the sample data provided.

The major focus of this data collection effort is to assess changes in productivity due to SWM adoption at the level of both the plot and the whole farm. This will be done in a number of different ways, depending on the farming situation.

The ideal situation is one where we have a natural experiment providing a "control" plot and a "test" plot on the same farm in the same year. This would be a situation where a farmer uses SWM techniques on some plots but not on other similar plots (e.g., similar soils, exposure to erosion, and crops). When this occurs, we should be able to compare the yields of the "test" and "control" plots to assess the impact of the SWM practices each year. As the farmers being targeted to participate in this monitoring effort will be limited to new adopters, we are hopeful that we will have a large number of "natural" experiments.

For farms where there is no natural experiment, the challenge is to find a basis of comparison between the yields on the field with SWM practices and a proxy "control" yield. Two options for proxy controls are (1) the average yield for that crop/zone reported in aggregate OHVN statistics, and (2) the yield obtained on a similar field cultivated by a neighbor who does not use SWM practices. Neither solution is ideal. The poor reliability of aggregate yield and production estimates in the OHVN compromise the first option. The difficulty of identifying a "similar" field in terms of soils, erosion, crop, and cropping practices compromises the second option. Given these weaknesses, some combination of the two proxies will be used.

A better, but slower, option for farms with no natural experiment is to collect data over time (5 to 10 years) and assess yield trends longitudinally. Given the common practice of cotton/cereal rotations in the OHVN, an analysis of yield changes for each crop in a two-year rotation would require a minimum of four years of data. Even with four years, exogenous events that have a strong impact on yield (drought, flood, insect attacks, animal damage) could complicate the interpretation of the results. Despite the lag that will exist between data collection and our ability to quantitatively analyze the yield impacts, this approach is appealing because it not only provides information on yield impacts but by following the same farm over a period of 5-10 years one obtains a full picture of the SWM adoption process (i.e., the sequencing of new adoption as well as cases of dis-adoption) permitting a more general analysis of how SWM adoption influences non-cropping enterprises and diversification (livestock, forestry, migration, off-farm income) or how other factors (e.g., introduction of new cash crops or other agricultural technologies) influence SWM adoption.

Although more thought needs to go into the exact procedures to use in selecting the farmers who will be monitored, ideas currently being considered are:

- Preference will be given to farmers who adopted an SWM technique during the 2002/03 season. Where it is not possible to find new adopters for 2002/03, selection of farmers adopting in 2001/02 will be permitted but supplementary data will be collected for 2001/02.

- For each extension agent (CAP) with SWM activities (there are approximately 60 CAP covering five to ten villages each) we will select three farmers (this will provide approximately 180 observations distributed across all nine sectors of the OHVN.

- Farmers will NOT be randomly selected. Criteria for selection will include (1) being a new adopter of a targeted SWM technique and (2) willingness to participate in the monitoring effort over a minimum of 5 years. In addition, farmers having a situation that presents a "natural" experiment will be given priority.

Once we have adequate data on yield changes that can be attributed to the adoption of SWM practices (2-5 years), we will use secondary data on input and output prices and estimates of labor time associated with the adoption of SWM practices to assess the profitability of selected techniques and the overall income impacts on the production unit. These quantitative estimates of profitability and income impacts will be compared to qualitative assessments made by participating farmers. Data collected on investments in productive assets and durable goods will also be used as proxies to assess income trends.

It is anticipated that empirical estimates of yield impacts from this monitoring and evaluation effort could be combined with data on rates of adoption and physical measures of adoption from larger surveys to estimate aggregate impacts of NRM adoption in the zone.[3]

Program Implementation: Table 4 presents a calendar for implementing this improved monitoring and evaluation system.

As mentioned above, effective monitoring of the impacts of SWM adoption must be done over an extended period of time. The proposed monitoring system needs to be followed for a minimum of five years if it is to provide reasonable estimates of the yield and income impacts of adoption. This length of time is also necessary to capture situations where farmers dis-adopt or neglect NRM investments after the initial adoption.

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[3] For example, OHVN conducted a census of all farms in 1999 to do an inventory of physical measure of NRM adoption and ICRISAT is currently collecting data on NRM adoption for a random sample of farmers stratified into three types of zones : those characterized by high, medium, and low levels of NRM adoption.

Although OHVN staff agreed with the authors'view that the OHVN should be able to support the year-to-year data collection and analysis activities within their regular operating budget, they expressed concern about the future of that operating budget. Among the uncertainties currently facing the OHVN are: (1) USAID/Bamako had not yet responded to a recent request for funding of the last year (2003) of their 10 year program, (2) future USAID support in 2004 and beyond is not know and a sharp drop in this funding would put pressure on the general operating budget, (3) moves are currently underway to privatize the cotton sector and the impact that this might have on the OHVN budget is not clear.

In addition to the funding issues, OHVN staff are concerned that a poorly implemented monitoring and evaluation effort which does not take into account the particularities of SWM adoption--e.g., the slow or delayed yield response after initial adoption or the cumulative impacts of combining several practices--will do them more harm than good. OHVN colleagues seem to view this more quantitative approach to monitoring and evaluation as producing a "report card" that will be interpreted as success or failure rather than as an instrument for feedback on strengths and weaknesses of the program that will provide information for making improvements and better realizing long-term goals. It will be important to assist OHVN in learning how to use the data to improve their performance.

Expanding the Knowledge Base: The SWM monitoring and evaluation situation in the OHVN is thought to be typical of SWM monitoring and evaluation systems throughout Africa. There are frequently numbers on physical units of adoption and rates of adoption but little more than anecdotal information available on SWM yield and income impacts. Available data are either based on research trial rather than farm-level results or restricted to a particular project or zone and seldom cover more than a year or two.

Recent efforts to synthesize available information for Africa (e.g., USAID 2002, Barrett et al. 2002) suggest that SWM programs have a great deal to contribute to growth in agricultural productivity and environmental protection, yet the lack of quantitative data on yield and income impacts is making it increasingly difficult to justify SWM investments. Without quantitative data on yield and income impacts it is extremely difficult to evaluate the contribution made by past SWM programs and to assess the potential costs and benefits of future SWM programs versus alternative efforts (e.g., biotechnology, irrigation) to promote agricultural productivity growth. One of the reasons that USAID funding to the OHVN is likely to decline in the future is that they have made a decision to shift a large share of their agricultural portfolio from the more risky and slower growth rainfed areas of the OHVN to the higher potential irrigated areas of the *Office du Niger* (Tyner et al 2001).

In addition to this pilot effort in the OHVN, we will be investigating the feasibility of testing a similar approach to monitoring and evaluation in Burkina Faso where there have been substantial investments in the promotion of SWM practices. The long-run goal of these trial efforts should be to encourage research and extension services to develop monitoring and evaluation systems that become an integral part of the agricultural database. Ideally, these monitoring systems would not be restricted to SWM practices but would evolve over time as the techniques and themes being promoted by extension services change.

IFPRI (October 2002) reports on efforts to develop a broad program of Monitoring and Evaluation for USAID's Agricultural Initiative to Cut Hunger in Africa (AICHA). The proposed monitoring system will be able to assess overall impact across programs, countries and sub-regions. IFPRI notes that:

> AICHA's emphasis on analytical rigor to justify expanded investments and assess overall impact demands the use of a monitoring and evaluation system founded on empirical evidence and sound economic theory. Such a system should be able to establish the various causal relationships between inputs (e.g., program interventions) and outputs (e.g., impact on productivity, incomes, poverty and hunger reduction), thus providing for better accountability and efficiency of AICHA resource use (IFPRI October 2002).

Although the program is still in draft form, it is clear that the basic data needed to monitor the contribution of technology change to economic growth and poverty reduction is the empirical data on yield and production changes. Providing this type of data will be an almost impossible challenge for most of the SWM programs now operating in SSA because they are not currently monitoring impacts. We are hopeful that the monitoring system proposed for the OHVN will serve as a model that can be adapted to other SWM programs in SSA and eventually supply the data necessary for the broader monitoring initiative being developed by IFPRI.

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Table 1: Area, Production and Yield Data for the OHVN: 1991/92 - 1998/99

Area (ha)		1991	1992	1993	1994	1995	1996	1997	1998	Trend
Cotton	area (ha)	10506	12201	8624	11692	14605	23158	30750	35816	’+’
	prod (tons)	11842	12494	10684	13097	16167	21990	28927	33740	’+’
	yield (hg/ha)	1127	1024	1239	1120	1107	950	941	942	-
Tobacco	area (ha)	209	285	331	237	100	83	77	87	-
	prod (tons)	411	525	549	330	160	133	105	112	-
	yield (hg/ha)	1971	1842	1661	1392	1600	1579	1853	1874	-
Millet	area (ha)	30906	31516	31892	34188	36660	35732	38149	37422	’+’
	prod (tons)	30226	23900	26700	31800	32441	36095	38714	35595	’+’
	yield (hg/ha)	978	758	837	930	885	1010	1015	951	stagnant
Sorghum	area (ha)	46603	48334	48140	51213	56009	59431	66390	72572	’+’
	prod (tons)	50508	43911	44622	47904	50292	64638	73047	75901	’+’
	yield (hg/ha)	1084	908	927	935	898	1088	1100	1046	stagnant
Maize	area (ha)	11099	11485	11648	12157	12834	13072	14411	15457	’+’
	prod (tons)	13845	13110	13938	11214	12929	14594	16814	20033	’+’
	yield (hg/ha)	1247	1141	1197	922	1007	1116	1167	1296	stagnant
Rice	area (ha)	4431	4656	4640	5243	5774	6333	7165	8596	’+’
	prod (tons)	4679	4553	4420	5194	5033	7188	8184	9941	’+’
	yield (hg/ha)	1056	978	953	990	872	1135	1142	1157	stagnant
Groundnuts	area (ha)	12297	12823	13331	13993	16210	16878	20286	23420	’+’
	prod (tons)	10889	9415	11807	12473	13896	14488	17962	21773	’+’
	yield (hg/ha)	886	734	886	891	857	858	885	930	stagnant
Fonio	area (ha)		749	1153	1084	1115	1344	1391	1271	’+’
	prod (tons)		287	476	526	507	652	684	796	’+’

Table 2: Illustrative OHVN Adoption Report:
Physical Indicators of NRM Adoption

NRM themes	Level of Adoption (units)				
	Prior to 1997	1997-98	1998-99	1999-2000	Sum
Rock lines (m)	79400	6485	10076	5329	101291
Branch barriers (m)	18500	780	2011	1574	22865
Small dikes (m)	38900	1492	775	457	41624
Vegetative bands (m^2)	8998	1341	4000	3240	17579
Living fences (m)	127022	12000	11831	9309	160162
Permanent field markers (ha)	1098	599	846	544	3087
Protected areas (ha)	450	450	615	750	2265
Diversionary gullies (n)	1417	625	1171	50	3263
Fire breaks(m)	5250	1406	615	500	7771
Controlled land clearing (ha)	140	300	-	-	440
Village managed forests (n)	1620	35	-	-	1655
Wells (n)	120	13	13	9	155
Deeping of mares (n)	68	2	1	2	73
Improved bas-fond (ha)	20	-	-	-	29
Village tree nurseries (n)	57	15	5	28	105
Plants from tree nurseries (n)	178800	13318	14640	45576	252334
Village woodlots	447	23	19	18	507
Improved cooking stoves (n)	2340	745	312	323	3720
Manure pits (n)	2268	265	338	-	2871
Stables for collecting manure (n)	13608	140	135	-	13883
Improved animal pens (n)	146	8	-	-	154
Compost pit (n)	1303	399	490	-	2192

Source: OHVN December 1999 and other OHVNdata . Notes: m=meters, n=number.

Table 3: Illustrative OHVN Adoption Report: Villages, Farmers, and Recoverd Area

Sector	Villages	Farms	Recovered Area (ha)
Kangaba	53	1529	3027
Bancoumana	57	2335	3221
Ouélessébougou	97	3628	7604
Dangassa	33	534	434
Fouani	110	3295	7264
Kati	70	1787	1303
Faladié	35	951	2274
Koulikoro	73	1358	2075
Sirakorola	79	2220	7656
Total OHVN	607	17637	34858

Source: OHVN 1999 data provided by M. Sylla.

Table 4. Implementation Calendar

2003	2004
JAN OHVN: (1) Approve final versions of data collection instruments and translate into Bambara; (2) Develop a plan for selecting villages, *animateurs*, and farmers who will participate, (3) Develop training plan (dates, locations, participants, budget).	**JAN**
FEB	**FEB**
MAR KELLY: Develop data entry template and design preliminary analysis tools.	**MAR** OHVN: Collect cotton production data and update resources questionnaire
APR OHVN/KELLY: Training of staff involved in data collection and supervision (one session for each of the 9 sectors). OHVN: Final selection of farmers to monitor and beginning of data collection for 2002/03 season.	**APR** OHVN: Data entry and cleaning of 2003/04 data.
MAY OHVN: Complete data collection for 2002/03 season	**MAY** OHVN: Preliminary analyses of 2003/04 data KELLY: Available via email for assistance if necessary.
JUN OHVN: Data entry/cleaning KELLY: Train DE/cleaning staff and analysts	**JUN** KELLY: Develop analysis tools to examine changes between 2002/3 and 2003/4 and train OHVN staff in use. OHVN: Complete analysis of inter-annual comparisons.
JUL OHVN/KELLY: (1) Complete DE/cleaning and preliminary analyses (2) make recommendations for improvements in data collection instruments/methods if necessary.	**JUL**
AUG OHVN: Begin data collection for 2003/04 season (resources and planting data)	**AUG** OHVN: Begin collection of 2004/05 data (update resources and planting information)
SEP	**SEP**
OCT	**OCT**
NOV KELLY, SYLLA, TRAORÉ: Prepare final report on 2002/2003 monitoring experience.	**NOV** KELLY, SYLLA, TRAORÉ: Prepare final report on 2003/04 and inter-annual comparisons.
DEC OHVN: Collect cereal production data for 2003/04	**DEC** OHVN: Collect cereal production data for 2004/05

Note: Funding beyond the ICRISAT/MSU holdback funding is being sought to cover these activities.

ANNEXES

Annex 1: See Excel file=Annex 1
Illustrations of yield/productivity improvements realized by farmers in OHVN

Annex 2: See Excel file = Annexe 2
Draft data collection instruments (multiple worksheets)