Protocol

Form for the collection of information on a good example of agrometeorological services or other agrometeorological information successfully provided to (or developed by) farmers in general or to (by) specific farming systems

A. Country/Province where the example was found. 
Nigeria, Kano State

B. Institute providing the example (with address). 
Shelterbelt Research Station, Forestry Research Institute of Nigeria (FRIN), P.M.B. 3239, Kano, Nigeria

C. Researcher(s) that collected/described this example (with their e-mail addresses). 
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D. Field(s) of Agrometeorology to which this example belongs. 
[Use the fields of interest defined for registration of members of INSAM.]

Agro-Forestry (AF), Agrometeorological Services (AS), Crop Protection (CP), Desertification (DE), Drought (DR), Extension (EX), Operational Agrometeorology (OA), RIsks in weather and climate (RI), User’s Needs in agrometeorology (UN)

E. Natural disaster(s) and/or environmental problems to which the example is related.

Desertification, Drought, Advection of hot air, High rainfall intensities during showers, Low water holding capacity and low fertility of sandy soils

F. Way, in which the example was found, defined and collected.

Ph.D.- and supportive M.Sc.-research at the Department of Geography, Ahmadu Bello University, Zaria, Nigeria, in collaboration with local governmental forestry organizations. Request from Government to look into protection efficiency of already established multiple shelterbelts.
G. Farming system(s) in which the agrometeorological service is applied or to which the agrometeorological information is provided for actual use.

Rainfed monocropping (sometimes intercropped), with farming based on low planting density millet with organic fertilizers as much as is available or can be afforded, most recently partly between multiple shelterbelts.

H. Regions of the county (or counties) where the example can be found.

Northern part of Kano State, not far from the frontier with Niger.

I. Villages where the example can be found.

Yambawa.

J. Description of the good example of operational agrometeorological services (maximum of one page A-4), with emphasis on agrometeorological components of the problem(s) concerned.

In the 1970s, and especially during the great drought of 1972-1973, the scale of human suffering was so great that passionate appeals were made for official intervention to halt desertification. As a result the Kano State Forestry Department devised a programme of land rehabilitation using shelterbelts. They established, as an agrometeorological service, more than 20 km of rainfed multiple shelterbelts - eleven in total - of *Eucalyptus camaldulensis* at Yambawa.

The area was a strategic one. It was near an important road used by caravans and traders and many ex-labour migrants had started to settle there. The shelterbelts settled drifting sand and undulations and encouraged the return of soil protecting grasses. Farmers tried to make use of the improved microclimatic and soil conditions between the belts by growing millets.

Research also indicated that better crop yields could be achieved by using higher inputs of organic fertilizers in combination with either of the following:

- The better design of multiple shelterbelts,
- Planting farmer friendly scattered trees at appropriate densities on the very wide land between the shelterbelts;
- Replacing shelterbelts by systems of scattered trees - the so-called parkland agroforestry traditionally in use in the area - but with considerably improved densities.
FRIN presented these recommendations and the outcome of the participatory experiments in several seminars attended by government extensionists and forestry staff.

K. Success and advantages of the example as judged by farmers concerned, where possible also expressed as estimated increase in income due to the services or information.

In the late 1980s, the authors started doing research - partly farmer-managed - on the shelterbelts to find out how the situation could be improved. The results of their research enabled them to develop a number of concrete recommendations with which farmers could agree.

Research showed, for example, that no allelopathy was involved in yield suppression close to the belts, as farmers believed, but that root pruning and branch pruning were necessary precautions to reduce competition between millet and trees. The farmers took to root pruning without any difficulty because they could see its benefits.

L. Difficulties encountered in introduction and use of this good example of agrometeorological services or information.

During the 1960s, the average annual rainfall in the city of Kano in Northern Nigeria was 825 mm. By the 1970s it had fallen to 700 mm and in the 1980s annual averages of about 650 mm were being recorded. Although rainfall remained fairly stable during the 1990s, farming under such conditions became increasingly difficult. In addition, population pressure has increased as labour migrants returned to the area after the oil boom in the South ended.

As a result holdings have become smaller and fallow periods shortened. Vegetation cover has been eliminated as trees in natural parklands have been cut down, bush burning has intensified and overgrazing has continued uncontrolled. Over-used, unprotected and exposed to sun and wind, soils in the area degraded rapidly.

In 1993, it was estimated that some 3000 people were affected by shelterbelts. Labour migrants continued to return home and the Forestry Department was convinced that these ex-farmers were returning because of the shelterbelts. This however, was a serious misconception. Many of them were disappointed to see that shelterbelts – that appeared to offer them little benefit - had been planted on their land while they had been away.

The heavy demand for fuel wood and for wood for building houses is one important reason for establishing a shared management system for shelterbelts and woodlots.
However, at the moment management is in the hands of the Forestry Department and farmers are still not involved. Fuel wood from the shelterbelts can be obtained through official channels, but only 40% of the farmers responding to a survey indicated that they got some wood through these channels. Also, the Forest Department did not allow farmers to prune the branches because fuel wood collection and sale is an exclusive right of the authorities. They nevertheless did not carry out these rights, giving appreciable shade influence from trees on crop yields.

M. Difficulties of the service or information as seen by the farmers concerned.

The shelterbelts were established near the end of a period when many of the local farmers were employed off farm and could not be involved in the process of establishing these belts. However, in the 1970’s, participatory approaches were also still uncommon and the shelterbelt programme took off without the involvement of local farmers. The Forestry Department made its decisions alone and did not involve any other stakeholders in the planning process. There were no contacts between Department officials and those engineers and scientists who could have supplied some useful information on how to construct shelterbelts. In addition, the Department had very poor access to written information about previous research and experience with windbreaks.

Without access to design rules and in order to deal with the problem of seasonal changes in wind direction, shelterbelts were established at an angle to the prevailing winds. This diminished their wind protective functions in both the wet and the dry seasons. As a compromise and in order not to occupy too much farmland, the belts had also been established too far apart. The usual distance between belts is about 10 times the final height of the trees. The Forestry Department, however, spaced its belts irregularly from 15 to 25 times the estimated final height of the trees. Because the belts were so far apart, they were unable to protect all the land between the shelterbelts and much of the soil was, therefore, left unprotected against hot wind.

The width of the shelterbelts themselves was arbitrarily chosen as 30 m, which meant they still occupied about 20% of farmland. Better results would have been achieved if both the width of the shelterbelts and the space between them had been halved. The farmers disliked the shelterbelts. Their agricultural land was being occupied and our early research already showed that the shelterbelts also competed for water, light and nutrients with their other crops, while, more seriously, the shelterbelts offered limited protection to the fields they were designed to shield. Instead of Eucalyptus trees, the farmers would have preferred indigenous tree species that could have offered food, fruits, fodder or medical products. They disliked their farmland being occupied without compensation and the fact that they were not allowed to do any maintenance on the belts, such as pruning the front
branches to stop the trees shading the front rows of crops, or coppicing which would have provided them with fuel wood.

N. Improvements envisaged or wanted/proposed in the service or information by the farmers, and the feasibility of such improvements.

At the moment the Forestry Department does not seem to have any plans for improving the efficiency of the shelterbelts. Present policy, financial restrictions and the lack of a tradition of participative approaches to these types of issues at the official level are important constraints. Therefore no workable solutions to the problems associated with existing shelterbelts and no other options, such as parkland agroforestry, to rehabilitate soil and stop desertification, are being developed.

The experience of northern Nigeria confirms that soil management and rehabilitation policies must be set in the context of wider development objectives and a well-defined direction of social change, in which federal as well as state authorities in Nigeria have an important responsibility. In developing a policy of soil rehabilitation, farmers’ input not only provides important insights but is also necessary for establishing effective and communal management systems. These systems should have enabled returning land-owners and farmers to get involved, and must now also be capable of evolving to meet the agro-ecological and demographic challenges of the region.

In addition to securing farmers’ participation, special extension intermediaries should be trained and equipped to improve the flow of information between researchers, farmers and government authorities.

O. Chances of expanding the application of the improved example.

Unknown

P. Related examples found elsewhere in the Province (or in the country for that matter).

None

Q. Do any research results exist on this service/information or on the agrometeorology from which it was derived?

Yes, a list of research publications of the group at the Ahmadu Bello University and FRIN is available. There are also four more general publications:


R. Could research assist in improvement of the service/information and how?

Research on a comparison of well designed multiple shelterbelts with sufficiently dense scattered trees in parkland agroforestry, in crop protection from advected hot air, would be very beneficial. Research into extension problems and joint management issues of trees and belts is urgently needed.

S. Any other comments from the collectors of this example that can help in understanding the many aspects of such services/provision of information.

None