MINISTERE DE LA COOPERATION ET DU DEVELOPPEMENT

FRANCO-NAMIBIAN RURAL DEVELOPMENT SUPPORT PROJECT

FARMING SYSTEMS ANALYSIS SUPPORT MISSION

Marc Dufumier, July 1993
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CONTENTS

I - THE AIMS OF THE MISSION

II - CONCLUSIONS OF THE DIAGNOSIS: some serious handicaps to overcome

2.1. Severe ecological limitations
2.2. Economic and social fabric in tatters
2.3. Poor, ill-equipped smallholders
2.4. The rush to fence
2.5. Soil fertility maintenance in crisis
2.6. Low performance in livestock husbandry and danger of overgrazing
2.7. Little processing or upgrading of farm produce
2.8. Extension services often lacking resources

III - PROJECT OPERATIONS

3.1. Objectives
3.2. Introducing tools, equipment and investment aid
3.3. Improving cropping and livestock systems
3.4. Support for local initiatives
3.5. Scientific and methodological support for the regional agricultural services

IV - FURTHER RESEARCH

4.1. Classifying the agricultural holdings
4.2. Characterizing the production systems
4.3. Closer study of the livestock systems
4.4. Farm income levels and income use
4.5. The land tenure situation
4.6. Defining agricultural development policies

APPENDICES

Appendix 1: Classifying farm holdings for diagnostic analysis of agrarian situations
Appendix 2: Maps
Appendix 3: Mission chronology
Appendix 4: Documents consulted for the purposes of the mission
Appendix 5: Terms of reference of the mission
I - THE AIMS OF THE MISSION

Under the Franco-Namibian Rural Development Support Project, the French Ministry of Cooperation is planning to carry out development schemes in the northern Namibian regions of Ohanguena, Omusati, Oshana and Oshikoto, in former "Ovamboland". The project is to be submitted to the steering committee of the Fonds d'Aide et de Coopération (FAC), for funding, in September 1993.

The main aims of the project are:

- To increase Namibia's food security, especially in the regions concerned, by substituting local produce for imported foods.

- To increase the food and money income of the rural communities directly or indirectly concerned, by increasing the productivity of their labour.

- To protect and strengthen the productive potential of the natural resource base.

- To provide scientific and methodological support for the regional agricultural services of the Ministry of Agriculture, Water and Rural Development in the design and monitoring of their operations in rural areas.

- To encourage farmers to organize.

- To help the authorities define a rural development policy for the regions concerned.

The team now in the field has just completed its analysis of the agricultural situation in the four regions for which the project is at present intended. Its conclusions stress the need to equip the farmers and help them organize to overcome the handicaps they still suffer from as a result of the former Apartheid system. It also stresses the need to promote operations that genuinely take account of the farmers' know-how.

On the basis of this diagnosis, the mission's aim was to help the project team and the local branches of the Ministry of Agriculture, Water and Rural Development to clearly define the activities to be undertaken over the three years the project is to last, and to specify the procedures for implementation of the project (see Appendix 5, Terms of Reference of the Mission).

The broad lines of the project were discussed at a report-back meeting with senior staff at the Agriculture Ministry. It was clear that the Namibian parties are increasingly keen to see the operations get under way soon, so that existing production systems can be rapidly improved and also to give Ministry staff a better understanding of rural society in these regions. Knowledge of the way society functions and how it is changing in this former homeland region is still very weak.

The mission took place under perfect conditions, owing to the diligence of the regional branch of the Ministry of Agriculture, Water and Rural Development, the French
Cooperation and Cultural Action Commission, and the entire project team. We take this opportunity to offer them our sincere thanks.
II - CONCLUSIONS OF THE DIAGNOSIS: some serious handicaps to overcome

2.1. Severe ecological limitations

The regions of Ohanguena, Omusati, Oshana and Oshikoto in northern Namibia have an annual rainfall of 300 to 550 mm which is generally sufficient for growing cereals, legumes and cucurbits (eg. millet, sorghum, cowpea, groundnut, squash, watermelon), sometimes in association with multi-purpose trees such as Sclerocarya binea (Marula), Hyphaenae petersiana, Diospyros mespiliformis, Cotaphaspernum mopane, etc. Yields of the annual crops can fluctuate widely from year to year.

Crops are grown mainly on sandy, ferruginous tropical soils (Arenosols) with a low humus content, in zones previously occupied by shrub steppe (to the west) or tree savanna (to the east). On the other hand, agriculture using existing methods seems not to be possible on the sodic and halomorphic soils found on the periodically-flooded depressions in the inland delta of the Cuvelai. Much of this seasonal wetland provides pasture when the water table falls and is used primarily as common grazing land.

*Water availability is very limited.* The Cuvelai floods replenish a fairly shallow aquifer (4 to 25 meters down) in the Oshana region, the eastern part of Omusati and the far western end of Ohanguena. But the water drawn from the wells (which are dug anew, manually, each year) is often unfit for human or animal consumption owing to its high saline content. Drinking water mainly comes from a supply system that brings water from the Cunene in Angola, where it is raised by pump. However, this system only partly covers the four regions concerned. The eastern and south-western fringes of the project zone only have regular drinking water supplies where deep wells have been drilled and equipped with motor pumps.

*Forage supply* depends on the variable supply of flood-recession pasture and crop residues in the Oshana region and surrounding areas (Okahao, Oshikutu, Ondobe, Endola, Eenhana, etc.). In the less densely populated western and eastern regions, it is taken from the tree cover as much as (or more than) from the herbaceous layer.

2.2. Economic and social fabric in tatters

The project zone essentially covers what was formerly Ovamboland. Ovambo society suffered severely from the impact of colonization and Apartheid. To supply the cash needs of their families, many adult men have had, and still have, to work away from home, taking manual jobs in the towns and mines further south, while their wives spend most of their time caring for children and food crops. The young adolescents mainly look after the livestock, moving with the herds on their annual transhumance cycle. The family unit is therefore often fragmented, though this does not exclude periodic home visits by the men.

The war also displaced many population groups. There are still many veterans and refugees trying to return to their home districts, though they may not be able to find
productive employment there apart from farming and stock raising work on the family holding. Unemployment has been increasing relentlessly in Namibia over recent years. The project must therefore try to maintain a decent income level for all those who stay in farming or want to return to it, while creating, if possible, new, remunerative, productive jobs in rural areas: craft activities, processing of crop and livestock products, various services to agriculture such as transport, well digging, etc.

Although the population is denser in those areas where water is most readily available, settlement is fairly scattered. The old solidarity ties of kinship and village have been weakened by the discredit that has fallen on many of the traditional chiefs who collaborated with the colonial authorities. Although many families supported the armed struggle of SWAPO (South West African People's Organization) and its programme, this does not seem to provide an adequate basis today for rebuilding a sound economic and social fabric in the post-war situation. The region suffers badly from the lack of genuine farmers' organizations other than a few Church-sponsored associations.

2.3. Poor, ill-equipped smallholders

Cash income from off-farm jobs is mainly spent on foodstuffs which the farms cannot supply in sufficient quantities and other staple consumer goods such as medicines and clothing. Even so, a recent study by UNICEF shows that 35% of children in former Ovamboland still suffer from malnutrition (Maria Kasita, 1993), so one of the project's goals will logically be to ensure food security for the poorest families. Two particular groups to take into account are households headed (a) by widows and (b) by former refugees.

Because of the economic insecurity felt by many workers in apparently precarious employment, many families save part of their income to invest in livestock, an asset that gives them relative security, provides for the old in retirement and constitutes a legacy for their children. Similarly, the farmers now willingly invest in fencing to mark the boundaries of their holdings, no doubt in the expectation that there will soon be a market for land.

Farming families do not seem to find it too difficult to earn enough money to pay for the few inputs they need (mainly seed), but many lack sufficient income to buy the equipment they would need to significantly increase the productivity of, and income from, their labour. As a rule, the women possess only a few hand implements for farm work (sole or socket hoes, machetes, etc.), and must often draw water from wells without pulleys, carrying water and fuelwood on their heads without any means of transport. Only a minority of families use draught animals for tillage, and the slow pace of manual tillage does not always allow families to sow as early as they would wish — a significant factor for low yields. Some farmers are obliged to plough their fallow land during the rainy season so as to sow as soon as possible at the start of the dry season. Manual weeding also sets a strict limit on the area one person can manage. It is common to see uncultivated areas (herbaceous or shrub fallow) within the enclosures, around the edges of the holdings.
The project will have to help the farmers acquire, individually or collectively, the implements they lack at present to increase their productivity and incomes. It should introduce, test, select and promote the use of the most appropriate tools and materials for overcoming the main bottlenecks that at present hamper the farmers (men and women alike) (see below, 3.3.2.). However, promotion of such equipment can probably not be done without subsidies from the project and government intervention in the form of loans.

2.4. The rush to fence

Although SWAPO's programme for many years included the land reform many farming families hoped for, this has not really been on the agenda since the 1991 National Conference on the land question and land reform. It is likely that farmers in the project zone and their successors will have to make do for some time to come with the land corresponding to the former "homeland", now generally referred to as the "communal areas".

Being unable to carry out a rapid redistribution of "commercial land", i.e. the very large private farms, the national land conference severely condemned illegal enclosure of common land, so as not to jeopardize "the future subsistence of small farmers". However, it has to be acknowledged that there is now a widespread rush to enclose the formerly common lands.

Two types of enclosure must be distinguished: fencing of large areas of rangeland to establish ranches, and fences intended primarily to protect standing crops from straying animals and crop residues from grazing under common-land grazing rights.

These two types of enclosure are almost certainly the precursors of two distinct types of landed property: latifundia and smallholdings. The nascent latifundia seem at present to be limited to a few areas in Oshikoto region (north of Mangetti), but they represent a genuine land reform which is in open defiance of the interests of small farmers. The fencing of smallholdings is far less dangerous, and it would probably be difficult to reverse the process now. It may even have some advantages insofar as the fences enable farmers to protect their own forage trees. But care must be taken reduce inequality in land attribution as far as possible. The area enclosed seems at present to depend mainly on the income available for fencing materials. Some are able to enclose significantly more land than they can actually cultivate with the means of production they have at their disposal, and the land so enclosed includes areas of bush suitable for grazing and which were formerly part of the common grazing land.

The poorest farmers generally cannot even enclose the land they cultivate; and since the area of common grazing land has been considerably reduced by the other farmers' enclosures, crop residues on unfenced fields are eaten all the faster by straying livestock. To prevent the pauperization and likely eviction of the poorest households, the project will no doubt have to consider assistance and subsidies to enable them to fence their fields. Hedges should be tried. In any event, the government should define the maximum area a farmer can fence in.
Particular attention should be paid to helping young farmers set up and helping returning veterans and refugees to resettle in their home districts. It will probably be best to give priority to the least densely populated areas, wherever drilling results make new settlements appear feasible. There seems to be the start of a trend in this direction in the eastern part of Ohanguena region, where farmers settled in western part are these days sending their children to cultivate the "cattle posts" where stock are corralled in the course of transhumance, and where the soil is therefore well manured in advance. Establishing satellite holdings of this kind may be a prelude to settling young couples on land previously used only for grazing. Pioneer land occupation of this kind will help to prevent excessive division of existing holdings in the more densely populated areas. In this case, other forage resources will have to be found for the stock, as the rangeland area will be continually reduced by such settlements (see paragraph 3.3.).

2.5. Soil fertility maintenance in crisis

The main limitations on yields of rainfed crops (millet, cowpea, groundnut, etc.) are (a) rainfall and (b) the organic and mineral fertility of these sandy soils, which have a relatively low capacity for water and exchangeable ion retention. Areas regularly manured by cattle penned overnight, and similarly manured areas around the kraals in the dry season, are cultivated every year, with mixed crops of several species or varieties. These areas give the best yields per unit area. Livestock in their daily patterns of movement transfer organic matter from common grazing land to fenced fields in the form of dung, and this plays an essential role in maintaining soil humus content. In the most densely populated areas, however, these lateral fertility transfers are now jeopardized by overgrazing of common grazing areas near the crop fields. Here the combination of shrinking area and declining forage potential considerably reduces fertility transfer in the form of fresh manure. The project will doubtless have to consider promoting new transfers from more distant areas, as yet under-exploited (natural grazing on seasonal wetlands, steppe and tree savanna, etc.), by harvesting forage and bringing it by animal cart to the farm holdings.

The extension of cropland area resulting from increased use of animal power on fenced land will inevitably be reflected in a reduction of the area and duration of the herbaceous and shrub fallow presently found around the edges of the holdings. The biomass from these areas is therefore likely to decline, resulting in reduced organic output for reconstituting soil humus. These uncultivated areas must therefore gradually be replaced by tall trees that can be grown in association with the annual crops. Some farmers in western parts of Ohanguena and Oshikoto are already trying this method, growing fruit trees (Sclerocarya bine, Dispyros mespiliformis, Berchemia discolor, etc.) among the annual crops in their fenced fields. The project should be able to provide farmers with a wider range of tree species that can be used in this way, preferably deep-rooting leguminous trees that can play a major part in renewing soil fertility without making too much shade for the crops (eg. Acacia albida, which drops its leaves at the very beginning of the rainy season). Existing forms of lateral fertility transfer should be gradually replaced by vertical transfers of minerals drawn from deep down and further increased biological nitrogen fixing.
The real impact of the possible use of chemical fertilizers is still to a large extent unknown, for lack of sufficient trials. It is likely, however, that the effects will depend on the degree of organic fertility. In any case, forecasts of doubling yields per unit area by this means seem completely illusory (N.P.B. Larsen, 1993).

Nor should it be forgotten that cereal yields also very largely depend on the care the crop receives (early sowing, frequent weeding, etc.). But this in turn depends very much on the time available for this work, which is usually done with hand tools. More attention can be given to these tasks if men and women do not have to spend so much time on domestic labour, water carrying, wood gathering, watering livestock, etc. The project will try to provide basic equipment to lighten the burden of well digging, water drawing, various carrying jobs, etc.

2.6. *Low performance in livestock husbandry and danger of overgrazing*

The very severe drought that hit the region in 1990-91 caused very high mortality among the livestock, the cattle especially, goats and donkeys having apparently withstood the drought better. Many authorities have attributed this to a shortage of forage compared to the large numbers of animals kept by the population (FAO 1992, IFAD 1993, SIDA 1992). Many writers fear that keeping over-large herds quickly leads to overgrazing, with disastrous consequences for natural resource conservation.

However, the real situation is rather more complex than this suggests. While it is true that the land around watering holes and fenced holdings in the most densely populated areas show obvious signs of overgrazing, this is not the case in all parts of the region. There are even some areas where forage resources are very much under-used, for example rangeland areas far from any permanent watering hole, where stock graze only briefly during the rainy season, when they can drink from temporary pools. The tree layer in these areas is very much under-used for stock feeding. The same applies to the seasonal wetlands in the "oshanas" area, where herbaceous vegetation grows very fast as the water table falls and is not fully grazed before it withers.

Many of the animals that died in the 1990-91 drought probably died of thirst. There is one particularly difficult moment in the year. This is when the stock, having been brought back to the main holdings to graze crop residues and stubble at the beginning of the dry season, have to return to the rangelands, heading for areas within reach of boreholes. This often involves a long trek, at a time of year when watering possibilities along the way are particularly scarce. The risk of mortality on the way sometimes prompts farmers to keep too many animals around the main holdings, leading to forage shortages in this vicinity.

The priority need therefore seems to be the possibility, in the relatively short term, of dispersing the herds more widely around the potential grazing areas and making full use of available forage resources by reducing the energy expenditure involved in excessive herd movements and avoiding any risk of overgrazing by over-concentration of stock in one place. This means establishing more watering holes around the rangelands as a
whole and in particular, if possible, along the stock routes. The French Ministry of Cooperation could no doubt help to drill wells and equip them with pumps.

A drastic reduction in the number of head of stock per family is not to be recommended, however. This would be against the interests of the farmers, who wish to keep large herds to ensure maximum fertility transfer to their fields and as a form of saving, for security. It must be borne in minds that livestock keeping at present has a number of purposes:

- meat production
- milk production
- savings, easily mobilized for possible foreseeable expenses or contingencies
- savings intended to increase the capital available for old age and to leave to children
- lateral fertility transfer
- occasionally, animal power for transport or tillage.

All authorities agree that livestock husbandry performance is low in terms of age at first calving, calving interval, calf mortality, annual weight gain, milk yield per cow, etc. But the causes they identify are many and various: poor health conditions, low vaccination rates, inherent difficulties in water supply, the distances covered, localized overgrazing, etc. The genetic factor does not seem to be a limiting factor. Writers generally stress the need to cull unproductive animals (adult males no longer gaining weight, barren cows, etc.), so avoiding excessive competition for limited water and forage resources. But here again, the problem is not so much to reduce herd size as to replace old animals with younger, more productive stock.

No doubt it would be a good thing in the long run for the region in question to specialize in calf rearing, selling young animals for fattening in regions where rainfall is more abundant. It must be realized, however, that three essential conditions must be met for a gradual shift to this kind of specialization:

- A real livestock marketing chain must be organized allowing sales of cattle on the hoof to regions specializing in fattening (eg. Angola? Kavango, Caprivi, South Africa?).

- Other forms of saving must be developed and promoted, of a sufficiently secure and remunerative kind to make it worth a farmer's while to cull elderly animals.

- Health conditions must be made sufficiently favourable for farmers to be sure their young cattle can safely replace those culled.

The project will thus have to explore ways and means of gradually meeting these three conditions, but without preaching drastic reduction in herd size, since farmers are well aware of the importance of the fertility transfer factor. It should be stressed that this will be a long-term task. Success will depend to a large extent on certain macro-economic developments in West Africa: the political and military situation in Angola, inter-government trading agreements, abolition of the quarantine line, etc.
For the time being, the foremost need is to alleviate the constraints under which stock farmers operate at present: prevalence of certain epizootic diseases (e.g. cattle plague, anthrax, pleuropneumonia), watering difficulties, localized overgrazing, etc. A major effort will have to be made to train veterinary field agents, equip rural districts with first aid kits, build cattle races, etc.

In this connection too, the project must consider creating more watering holes. Besides the boreholes already mentioned for under-used rangeland areas, cement-lined, lipped wells should be built for permanent use on the seasonal wetlands. Repeated digging of wells on the "oshanas" currently involves a good deal of male labour that could usefully be applied elsewhere if these wells were not regularly silted up during temporary flooding. The project will take advantage of this to train well-diggers in new well-digging techniques that will enable them to dig deeper, more productive wells. The project could also introduce and promote new water drawing and transport techniques with the corresponding equipment (pulleys, shadufs, hand or foot pumps, animal-driven turnwheels, animal-drawn carts, etc.) making it easier for the people to draw water and transport it to the troughs. Digging and equipping wells must go hand in hand with forming users' associations, however, each with its own management and maintenance committee. This also applies to the motor-pump wells mentioned for the remote rangeland areas.

To avoid the overgrazing observed at present around the field enclosures, as many animals as possible should leave for the rangelands after a few months' grazing on crop residues and seasonal wetlands. The only animals left at the end of the dry season should be those needed immediately for draught purposes, daily milk consumption, savings that can be rapidly liberated, etc.

Donkeys that stay all year round near the crop fields, and of which there sometimes seems to be a prodigious number, could be better used than at present. They should supply most of the draught power needed for tillage and for carrying goods and people. Most soils being sandy, farm implements can be fairly light. Putting the donkeys to work should make it possible to send more cattle out to the satellite holdings at the end of the dry season, so reducing pressure on areas where the main holdings are concentrated.

In any case it will be necessary to increase forage biomass production around the main holdings, with special emphasis on those forage trees and shrubs best able to supply protein at the end of the dry season. For this purpose the project will try to encourage farmers to plant leguminous trees. Some species are already being introduced to the region by the forestry authorities: Cajanus cajan, various Leucaena, Acacia and Prosopis spp., etc.). Certain indigenous forage species, such as the mopane, should be protected.

2.7. Little processing or upgrading of farm produce

Farming families are at present ill equipped for processing and upgrading their farm produce.
Millet is threshed by hand and ground without a mortar. For buttermaking, milk is churned in a kind of calabash (*Lagenaria siceraria*). Meat drying methods are practically unknown in rural areas and hides are under-utilized for lack of artisanal tanneries.

It should therefore be possible to increase the productivity and remuneration of work on the farm by introducing new tools to facilitate post-harvest operations and processing of animal products: pedal or hand-crank threshers, pestles and mortars, mills, straw-choppers, winnowing fans and machines, plunger churns, artisanal tannery and butchery facilities, etc.

Similarly, it should be possible to considerably reduce consumption of fuelwood for cooking by introducing and promoting improved cookstoves.

2.8. **Extension services often lacking resources**

The regional services of the Ministry of Agriculture, Water and Rural Development are in the throes of restructuring and should be given new prerogatives under the current decentralization policy. For the time being, however, these agencies do not have the means to fulfil their mission in an effective way.

The outreach system planned at the national level seems to be inspired by the training and farm inspection system recommended by the World Bank. However, such is the lack of logistical resources that the extension officers can usually only operate on-site at the new Agricultural Development Centres, whose functions are as yet ill defined: demonstrations of new methods, sale of equipment, distribution of loans, etc.

Other problems are probably even more serious. The extension services are having great difficulty in designing, formulating and implementing operations adapted to the different localities and types of farm. Certainly they lack adequate, reliable agronomic references on very many farming methods. Examples of this are the use of chemical fertilizers and the best spacing and layout of plants in inter-cropping systems. So it would seem pointless to try, at the outset, to promote the use of chemical fertilizers or row cropping with standard spacing.

The project could therefore usefully aim to provide the regional farm extension services with scientific and methodological backup so that they are better able to design, formulate, implement and monitor suitable operations in each of the farming situations they wish to change. This support for the agriculture authorities seems especially necessary in that the farming communities have already proved very receptive whenever the technical ideas suggested to them really coincide with their interests. For example, they have willingly adopted a new, short-cycle millet variety bred and recommended by ICRISAT.
III - PROJECT OPERATIONS

3.1. Objectives

The operations of the Franco-Namibian Rural Development Support Project will be mainly designed to:

a) Help establish a better balance in the national economy, to the benefit of populations groups that have suffered most in the past.

b) Help smallholders acquire the necessary means of production to increase the productivity of their labour and improve their incomes in both food and cash.

c) Create opportunities for productive, gainful employment for all who cannot (or can no longer) find off-farm waged work under good conditions and, more particularly, to help young farmers set up and veterans and refugees return to their home districts.

d) Improve crop and livestock farming systems and increase the volume and quality of farm produce, whether intended for sale of for on-farm consumption, while conserving and strengthening the ecological potential of their environment.

e) Enable and assist rural producers to get organized so that they can practice their profession effectively and benefit fully from advantages.

f) Provide scientific and methodological support for the regional services of the Ministry of Agriculture, Water and Rural Development, enabling them to base their regional farm development operations on a sound footing.

Under existing economic circumstances it is difficult to find work in mining or urban activities, and it would therefore be wrong to try to increase productivity in farming to the detriment of job creation in rural areas. These two objectives must be pursued jointly. Priority will therefore be given to increasing farmers' productivity at peak periods in the farming year, leaving them time to devote to other productive, gainful tasks without depriving non-farmers of work. The project will therefore intervene only on family holdings which will profit from increased productivity to boost output and incomes. Particular care will be taken to relieve the women of some of their burden of work, it being the women, at present, who do most of the work on food crops, their productivity being limited by the many other daily tasks they have to accomplish: water carrying, fuelwood gathering, domestic work, etc.

The project will place top priority on three pilot sites selected as being representative of the main agro-ecological and socio-economic conditions prevailing in the project zone: (a) around the Olushandja reservoir in Omusati region; (b) the Endola area in Oshana region; and (c) the area between Odonbe and Eenhana in Ohanguena region. The lessons drawn from experience in these three areas will be used to select the most promising operations for wider application. However, this obviously does not exclude
starting some schemes outside these three areas at an early stage, in support of local initiatives involving clearly-targeted investment operations.

Broadly speaking, a clear distinction must be made between those operations which the project can quite quickly implement on a large scale in the certainty that they will be effective, and those which will need a preliminary research-and-development stage to adapt them to circumstances. For example, it will probably be possible to act quite fast to install certain water-drawing and stock watering hardware items, whereas trials will have to be run with some farm implements and forage legumes before trying to generalize solutions to the problems of tillage and soil fertility maintenance.

3.2. **Introducing tools, equipment and investment aid**

No adjustment of the economic balance in favour of the northern regions can be achieved without introducing new means of production. This is an absolutely essential condition if farmers are to increase the productivity of their labour and gradually improve their incomes without having to depend permanently on government assistance and outside aid.

There are two main types of equipment concerned: **equipment for community use**, for which users' associations and management committees will have to be formed, and **equipment for individual holdings** and artisan units, for which access will have to be facilitated through subsidies, loans, etc.

It should be possible to install the **community equipment** relatively fast (during the first year of the project) with help from the French Ministry of Cooperation. This heading covers infrastructures and equipment to facilitate **water drawing** and **watering livestock**: boreholes and deep, lipped wells; pulleys and shadufs; foot, hand and motor pumps; animal-powered turnwheels, cattle races and pens, etc. It could also include machinery for **post-harvest operations**, which could perhaps be entrusted to farmers' groups: threshing equipment, mills, etc. This equipment would mainly be paid for by the project, but users' associations could be asked to make a contribution in the form of labour or money for installation and maintenance. In any event, strictly formal agreements will have to be drawn up in advance, in each case, to lay down the rules governing their use and the rights and duties of the parties concerned. The project will doubtless also have train those responsible for management and maintenance. In some cases the project will have to consider training the craftsmen and entrepreneurs who are to build the infrastructures: well-diggers will certainly have to have some practice in new techniques for deep boring, reaching below the water table and progressively consolidating the sides (sliding forms).

The main items of equipment required for farms and artisanal processing units and destined mainly for **individual use** are:

- A large number of **hand tools** which farmers lack at present and which are badly needed for certain essential tasks (forage harvesting, haymaking, handling of organic matter, etc.). The project should be encouraging use of forks, rakes and scythes,
spades, flails, and "ilers", hoes, adzes, herding equipment, branding irons, etc. It would also be worthwhile to replace sole tools with socket tools.

- **New means of transport**: wheelbarrows, packs and saddles, two- and four-wheeled carts, tank-wagons, sleds, yokes, panniers, collars, water-skins, milk cans, etc.

- **Processing equipment** for animal and vegetable matter: mortars, hand or foot pestles, threshers, mills, winnowing fans, improved cookstoves for saving on firewood, churns, presses, butchery and tannery equipment, etc.

- **Fencing materials**: wire, hedge plants (*Euphorbia balsamifera*, acacias, cacti, aloe, etc.)

- **Animal-powered tillage equipment** (ploughs, seed planters, weeders, ridgers, etc.) of the kind currently in use on Senegalese groundnut farms (donkey- and ox-drawn).

- Possibly **small walking tractors**.

Many of these items can only be popularized after trials and adaptation to local farming conditions. Several prototypes should first be introduced and lent to interested farmers. The project would then monitor how they are used and their agronomic, economic and social effects in some detail.

Only in the second or third years will it be reasonable to consider promoting those tools that have been most satisfactory in use. As far as possible, manufacture of the tools should be entrusted to local craftsmen, some of whom seem to be already fairly well equipped for this type of work (eg. Bush Master in Oshakati).

Full use of some equipment, and payback of the investment under good economic conditions, will probably depend on the farmers concerned turning to farm work contracting and transport services for their neighbours, in addition to their own farm work. But the initial promotion of new tools and equipment will certainly only succeed if accompanied by subsidies and loans.

Tools and equipment will only be accessible to poor farmers if they are sold at subsidized prices, with private traders, agricultural development centres and farmers' groups (if such exist) acting as agents.

**The project must not itself handle management of equipment loans and loan recovery.** These functions must be sub-contracted to specialized financial institutions, public or private: commercial banks, the Credit Union League, the Agricultural Bank of Namibia, etc. Initial contacts with the Standard Bank suggest that an operation of this kind will be possible only if the project deposits a guarantee fund or advances working capital. Consideration could also be given to formulae in which farmers or craftsmen would set up their own groups to provide mutual guarantees and contribute to insurance costs by paying an interest rate slightly higher than that usually applied by the banks when large guarantee deposits have been paid. Remuneration of this deposit could also cover part of the insurance costs.
In any event, a clear distinction should be made between subsidies, which will be necessary in the first stage, and debt cancellation, which should be strictly excluded.

3.3. Improving cropping and livestock systems

Efforts to improve cropping systems will have to take account of the fact that intensification and increased yields will not be possible without a significant increase in input of organic matter on areas already inadequately manured by overnight penning of animals. For some time to come, manuring will still depend on lateral transfer of organic matter due to the daily movements of the herds between the common land near the main holdings and the kraals where they are kept overnight. These transfers depend in turn on the amount of forage biomass available in the vicinity of the fenced fields. To increase these lateral transfers, one must be able to increase the number of animals penned overnight without overgrazing the common land around. That will only be possible in the long run if tools and equipment are introduced to gather in under-exploited forage (flood recession grassland and forage shrubs) and storing them after transport until they are needed. The project will popularize reaping and haymaking techniques little by little, as the tools concerned are introduced.

In the short term, increased food crop production will inevitably depend on extending the cultivated area within the enclosures, a step which will be possible with the use of ox- and donkey-powered cultivation (ploughing, sowing, weeding and ridging). Since any extension of the cultivated area is likely to reduce such herbaceous and shrub fallow as remains in the enclosures, it will be preferable to encourage farmers to plant permanent stands of deep-rooting trees of species that compete as little as possible with the annual crops, for optimum utilization of water and light. The project will test and popularize the use of the best leguminous shrubs and trees for enabling vertical transfers of fertility, enriching the soil in nitrogen by biological fixation and providing an organic matter input in the form of fallen leaves. Besides shrubs that can be used for hedging, the most obvious candidate is Acacia albida, planted right inside the fields: the leaves of this tree fall at the very beginning of the rainy season, providing about five tons of dry matter per hectare, including 300 nitrogen units, for a density of only forty trees per hectare.

On the other hand, it would be pointless to try to lay down very precise standards for inter-cropping (spacing between the different species and varieties) in view of the multitude of different micro-ecosystems the women maintain in their enclosures (ranging from concentric rings, cultivated continuously and variously manured, to hastily-sown, rarely weeded areas in rotation with herbaceous or shrub fallow of variable duration). On the other hand it may be useful to help the women broaden the range of species and varieties they grow, with special emphasis on relatively hardy cultivars (short-cycle millet, Angola peas, vouandzou, etc.) The question also arises as to whether it would be best to rehabilitate certain indigenous species such as Vigna lobeifolia, which produces edible tubers rich in protein. Be this as it may, it should be possible to sub-contract some plant behaviour trials to the agricultural research station at Mahanene, perhaps with the collaboration of ICRISAT, while the project itself would evaluate results obtained under small-farm conditions.
Market garden crops could usefully be popularized in the few areas where water is not a limiting factor, e.g. in the vicinity of the Olushandja in Omusati region. First, however, the project must be certain that the farmers have access to means of transport, which are absolutely essential for taking produce to market and carrying dung.

Operations on the livestock side should be designed to:

- **Improve the health status** of the herds (training veterinary field agents (vaccinators), setting up small village pharmacies and cattle races, etc.).

- **Avoid overgrazing** of common land around the enclosures; using donkeys for draught on the main holdings, **sending the cattle back to the satellite holdings early**, cutting forage on the seasonal wetlands and **storing hay** near the dwellings, etc.

- **Make full use of crop residues**, e.g. perhaps chopping straw and popularizing the use of urea in feed as a complement to straw.

- **Disperse herds as widely as possible** on the more distant rangelands and limit the distances the stock must walk each day for water. This can only be achieved by increasing the number of water holes in areas at present under-exploited.

- Introduce and disseminate **new forage species** in the enclosures (*Acacia albida*) and on the common land, with special attention to legumes and tree browse.

- Encourage farmers to **cull excess animals** (barren cows, adult males not gaining weight), making it easier to replace them with younger, more productive stock. This depends on being able to organize a marketing channel for lean animals by setting up cattle markets and promoting other forms of saving than accumulating livestock as at present.

- Promote new ways of **upgrading animal products and by-products**: improved methods of butchery, meat drying, butter making, hide tanning and sandal making, etc.

Utilization and conservation of natural resources will go hand in hand with the changes in cropping and husbandry systems and the wider scatter of water holes. They will also be helped by dissemination of new means of transport enabling farmers to fetch water, forage and fuelwood over more and wider areas than at present. **Popularization of improved cookstoves** and **promotion of hedges** should make it possible to gradually reduce per capita wood requirements and hence the amount taken from trees and shrubs in the bush.

3.4. **Support for local initiatives**

The diagnosis undertaken by the project team cannot claim to have identified all the possible responses to the problems of rural development in the four regions under consideration. It is likely that as the project progresses there will be requests for
assistance, coming from individuals, groups or enterprises with innovative ideas that deserve support.

The project will have to be open to such initiatives, in each case verifying that the proposal is in the general interest (creation of productive jobs, diversification of sources of income, structuring of civil society, improvement of living conditions, etc.).

The project team will pay particular attention to initiatives from refugees who, having travelled, seen other situations and acquired new habits can quickly help to stimulate progress if only they have access to the necessary means of production.

3.5. Scientific and methodological support for the regional agricultural services

One of the project's aims will be to provide scientific and technical support for the regional extension officers in their task of designing, formulating, implementing, monitoring and evaluating rural development projects.

Training will begin in the field with the extension officers directly involved in the project. But it could also be continued for the benefit of all the region's extension workers through a series of seminars for discussion and exchange of ideas on the main topics of interest: diagnosis of rural situations, methods of intervention in rural areas, monitoring and evaluation of project operations, etc.

The seminar on diagnostic methods could take place during the first year of the project, based on the experience accrued in the course of the project's own preparatory diagnosis. It would also be useful to show how it was possible, by analysing rural situations in terms of farming systems, to identify the main thrust of the project operations without having to carry out costly surveys. Emphasis will be laid on the need to take account of the many-sided inter-relationship between socio-economic conditions and technical and ecological change. Particular importance will be given to the impact of these interactions on opportunity costs for the labour force depending on the season of the year and the possibilities of off-farm work, the many economic and social functions of livestock keeping, the effects of existing husbandry systems on fertility transfers and the dangers they involve for natural resource conservation. It will then be shown why operations cannot be designed as standard formulae by the authorities and imposed on the rural communities without taking their interests into account but must, on the contrary, be guided by a concern to create new technical and socio-economic conditions enabling greater convergence between the particular interests of each type of farm holding and the interests of the nation as a whole.

The seminar on operational methods will be held once the project has proven itself, so as to take account of the experience acquired locally. A first topic will be methods to apply when running trials with farmers and testing new methods on their farms. Next will be observation exercises and surveys for assessing whether and how to extrapolate from the trial results. But the seminar will also cover the methods to use in promoting general use of well-proven methods and encouraging farmers to acquire the corresponding means of production. The problem of communication with farmers must be discussed at length,
with the aim of achieving a genuine exchange of experience between extension workers and farmers. Methods using exchange of ideas and experiences, with reciprocal farm visits, will be systematically encouraged, with logistical backup from the project.

The seminar on monitoring and evaluation must teach the extension workers methods for early assessment of how the practical effects of their operations are developing, so that they can re-adjust operations according to results, farmers' reactions and possible changes in the economic environment.
IV - FURTHER RESEARCH

4.1. Classifying the agricultural holdings

To define the operations to be undertaken with each class of farmer and distribute operations as well as possible, the diagnostic analysis should be supplemented by a classification of farm holding types in the three pilot areas.

It is advisable first of all to identify the main types of holding according to the following criteria:

- The importance of non-farm incomes and their possible effect on farm investment;
- Off-farm job opportunities, whether or not they compete with farm work;
- The existence or not of satellite holdings;
- Size of cropping area and fenced area;
- Number of livestock (cattle, goats, donkeys) and their different functions (milk and meat production, draught power, fertility transfers, security savings, etc.);
- Importance or not of transhumance;
- Amount of capital equipment: hand tools, animal-powered implements, motor-driven equipment, wells, boreholes and water-drawing equipment.

This identification of the different holding types must be done rapidly, by means of semi-structured interviews with older farmers who have a good store of knowledge about past and present processes of differentiation among holdings. These interviews would cover recent changes in agriculture and would be designed first of all to identify the causes and forms of differential trends among the holdings: how some farmers will have accumulated capital and acquired more equipment while others have lost their capital base and become pauperized; specialization or diversification in production systems; tendency towards subdivision of holdings; etc. The key task here will be to identify the main criteria that distinguish between the different farm types and to have, for each criterion, a rough idea of the upper and lower thresholds for a given type of operational approach, above and below which the project must take a significantly different approach.

Appendix 1 sets out principles and methods for drawing up such a classification without having to run complex, closed surveys on large random samples at an early stage.

4.2. Characterizing the production systems

Having identified the different types of holding, detailed characterization of the farming systems used on the main types of holding must be done by taking a relatively small sample of production units, deliberately chosen from the most archetypical farms in each class (judgement sampling), and carrying out a case study of each.

The purpose of characterizing the farming system in operation on each of the holdings in the case studies is to pinpoint more surely the bottlenecks the different types of farmer
have to cope with and to define more precisely the operations to be undertaken with each group. Factors to bring to light will be:

- **The spatial and temporal combination of the different cropping systems** on the main holdings and satellite holdings, taking account of the importance of organic matter transfers to or from each part of each holding, and the possible impact of such transfers on soil fertility maintenance.

- **Herd husbandry methods**: seasonal movements, seasonal break-up of herds into smaller groups, veterinary care given to each group, impact on the effective fulfilment of the different functions assigned to livestock keeping.

- **Labour demand peaks** affecting different members of the family as they divide their time among their different activities: cultivation, livestock care, travel, transport, woodcutting, water carrying, off-farm work, etc.

Appendix 1 also sets out the principles and methods for pinpointing the characteristics of different farming systems once the different farm types have been identified.

### 4.3. Closer study of the livestock systems

Given the number and size of the herds and the long-term dangers for natural resource conservation inherent in the existing herd management methods, a deeper understanding is needed of the different stock husbandry systems and the numerous economic and social functions of the herds. This will mean looking at the whole of the North and Northeast of the country, particularly so that livestock marketing channels can be taken into account.

A survey of the project zone can be started straight away, however, with a view to highlighting particularly:

- The factors that determine the *health status* of cattle, goats and donkeys and how this could be improved;

- The factors governing *herd movements*, both daily and seasonal, and their effects on soil fertility transfers and the reproduction of natural resource potential;

- Prevailing conditions concerning *sale of animals and animal products and services*: meat, milk, hides, draught power, etc. The important point here will be to understand what conditions will induce farmers to dispose of animals that are not directly productive faster than they do at present: will it help to set up new stock marketing channels or introduce new forms of saving, for example?

This study of stock farming systems could be started by French or Namibian student trainees. The project will have to take care in selecting the students’ survey sites according to relative herd sizes and numbers (of cattle, goats and donkeys), relative ease of access to watering points and the relative abundance of forage resources.
The final synthesis could perhaps involve a specific field trip by a specialist in rangeland stock husbandry (veterinary or zootechnician), whose task would be to view the students' conclusions in a wider regional perspective and confirm or modify them, taking account of the prevailing circumstances in neighbouring areas.

4.4. Farm income levels and income use

It will be important to acquire more information about (a) the factors that determine the amount of monetary income from on-farm and off-farm activities and (b) factors governing the use of that income: expenditure on staple requirements, social or ritual obligations, productive investment, saving in various forms (including livestock), etc.

Monitoring a few family budgets could also be a job for student trainees, with scientific and methodological help from the project. These studies will have to be run on a small number of holdings of markedly different types. In each case, the study will have to highlight interactions between the management and economic performance of the farming system in question, off-farm incomes, food and money requirements for family consumption, capacity to save and forms of savings if any, cash flow management, etc. The essential question is whether it will be possible to promote other forms of saving than livestock keeping and, if so, under what conditions.

4.5. The land tenure situation

The project will have to acquire a better understanding of recent and ongoing changes in the land tenure situation, with particular emphasis on:

- The effective or residual role of the headmen in allocating land and the possible emergence of a land market and land rents.

- The practical conditions under which enclosure is currently taking place;

- The factors that determine the establishment of satellite holdings in peripheral areas;

- Practices relating to inheritance and (if any) subdivision of holdings among heirs (eg. matrilineal or patrilineal descent?)

- How young people and returning refugees set up in farming.

4.6. Defining agricultural development policies

All these complementary studies and the subsequent monitoring and evaluation of project operations should make it possible to shed a clearer light on the interests, resources and know-how of farming communities in the regions concerned. Their technical, economic and social behaviour is undergoing profound changes at present, but is still very little understood. Senior Ministry of Agriculture staff in Windhoek have
expressed interest in information of this kind, as it should help them define their agricultural development operations more precisely. This is one of the fundamental goals of the Franco-Namibian Cooperation Project: to help in defining a new rural development policy for the North of the country.
APPENDICES

Appendix 1: Classifying farm holdings for diagnostic analysis of agricultural situations

Appendix 2: Maps

Appendix 3: Mission schedule

Appendix 4: Documents consulted for mission purposes

Appendix 5: Terms of reference of the mission
APPENDIX 1

Classifying farm holdings for diagnostic analysis of agrarian situations

Marc Dufumier

I - The aims of diagnostic analysis and the role of a classification

The history of agricultural development programs and projects in Africa shows that there can be no effective agricultural development scheme without prior scientific knowledge of the real agrarian situation prevailing in the project area. Even today, in the 1990s, many projects are doomed to failure because of a poor understanding of local conditions and the forms of agricultural development local farmers have already put into practice. This is particularly true for projects based on extension work with a small number of standard techniques or innovations such as selected seed, seed density, fertilizer dosage, etc.; the information proffered is the same whatever the type of holding concerned, yet it can hardly be appropriate to the whole, wide range of conditions the farmers are working under.

Only too many projects fail because they do not make the necessary effort to get to know the farmers’ needs and problems right from the project design stage. The techniques recommended then spring primarily from untested presuppositions rather than a strict understanding of the real field conditions. The frequent use of implied value judgements in such terms as "improved varieties" and "good yields", etc., is a perfect example of the subjective thinking of very many agronomists, even today.

In the face of repeated failure in programs and projects of this kind, designed and formulated in total ignorance of the practical reality, voices are now being raised to stress the importance of a diagnostic analysis prior to any development operation. In many research and development projects efforts are now being made to acquire a fairly detailed knowledge of trends in the real conditions the project will be seeking to nurture or modify.

As a rule, scientific analysis of local agrarian systems comes in at the identification and preparation stage of a research and development project. The aim is to enable planners to formulate appropriate solutions for the localities where schemes are to be set up. But analysis can also continue during the project work, through a rigorous process of monitoring and evaluation. Observation of farmer reactions to different operations then leads to a better grasp of the conditions required for agricultural development, and the project can constantly redefine intended operations in the light of new knowledge.

The main purpose of a diagnostic analysis is to identify and grade the factors conditioning the choice and evolution of agricultural production systems (ecosystem, social relations, availability of means of production, etc.) and to understand, in practical terms, how these affect changes in agriculture. It is not just a question of identifying the ecological, economic, social and political potentials and limitations of a region. It is also important to discover how the different factors can be modified so as to steer agricultural
development towards a pattern that is more in line with the common interest. If one is aiming for willing participation in future projects by a great majority of the economic agents concerned by agriculture, then there is a need to identify the conditions that must be created to enable this; and to this end, a diagnostic analysis is absolutely essential.

Quite clearly, ecological conditions are not the only factor that farmers take into account when they choose their farming methods. Economic and social considerations are also very important in decision-making, and it is pointless to suggest methods that do not coincide with farmers' interests or for which they lack the necessary material and financial means.

A farmer does not operate as an isolated producer but is constantly interacting with other economic agents: neighbouring farmers, landowners, merchants, truckers, craftsmen, government agents, etc. These social relations have a very considerable impact on a farmer's choice of product or technique. He/she will only use those methods and techniques that accord with his/her interests and for which he/she has the necessary resources in sufficient quantity. It is up to the project agencies to create conditions that will give farmers an objective interest in using methods that are more in line with the common interest, and ensure that they have the means to do so. Chief among these conditions are those concerning land ownership, land tenure systems, agricultural credit, input supply, equipment and spare parts, the existence of adequate infrastructures, and marketing of produce.

However, not all the farmers in a given region are faced with the same economic and social conditions. To reproduce their conditions of existence and raise their living standards, not all categories of farmers in the same ecological region will have an interest in using the same techniques or working the same production system. It is a mistake to regard small farmers as one homogeneous group to whom one can recommend universally applicable techniques. The reality is often far more complex and it is always advisable to seek appropriate solutions for each category of farmer, in the specific conditions in which they work. One must therefore identify the different farmer categories concerned, taking account of their interests, the means they have at their disposal, the social relations within which they operate, and their behaviour in the face of technological change. That is the function of a typology of farm types in diagnostic analysis of agrarian situations.

II - Classification criteria

Although everyone agrees, these days, that it is necessary to classify farmers before defining agricultural development programs and schemes, opinions differ widely as to the right criteria to choose for differentiation. The main difficulty springs from the fact that farmers’ behaviour is shaped by a vast and varied range of factors: the relative scarcity of resources at their disposal, the production and exchange relations they have to cope with, etc.

The easiest approach is to give priority to availability of resources (land, labour power, means of production, capital, etc.); it is usually not too difficult to gather information on
these aspects, and the data gathering may already have been done by the agencies responsible for statistics. One then tries to see whether there is a close link between these structural data and the presence of this or that crop in the fields. This approach is of very limited relevance, however, because the production systems worked by the different types of farmer very often combine a large number of activities that are not chosen primarily in terms of resource availability.

These production systems generally combine several different crops and animal products, the farmer dividing the available resources among them according to a multitude of agro-ecological and socio-economic constraints. Farmers cannot run their rotation in any order they like; they must program their rotation and lay out their cropping plan carefully, taking account of the foreseeable effects of production costs, pest hazards, soil fertility maintenance, etc. Combining crops and livestock means that the livestock must be able to find a fair proportion of their forage intake on the farm itself, and herd management must inevitably take account of more or less unforeseeable seasonal variations in forage availability in the form of grassland, forage crops, crops residues, etc. Combining several productive activities can periodically create difficulties in the management of available resources: labour demand peaks, cash flow deficits, severe strain on overworked machines, etc. All these problems will be resolved in different ways according to the prevailing economic conditions (access to credit and markets, availability of waged labour, ease of supply, off-farm job opportunities, etc.). If one only takes account of the constituent elements of the holding, one cannot explain local production systems in all their complexity or the differences among the farmers.

The experience of many diagnoses has shown that any typology with relevance for development work must seriously take account of the general background against which the farms are operating. Ecological conditions are generally fairly easy to take into account using available charts and maps: soils and landform, climate and hydrography, vegetation maps, aerial and satellite photographs, etc. By overlaying documents of these kinds drawn up at the same scale one can often divide the region under consideration into relatively uniform zones from the standpoint of agronomic capabilities and limitations, and the synoptic document is sometimes presented in the form of a "land suitability map". This is a highly misleading term, however. History shows that land use and crop choice in one area can change very fast with changing socio-economic conditions and the state of available technology. Nor must it be forgotten that in any one agro-ecological zone, it may not be in the interests of all farmers to apply the same production system. In the light of this, one cannot attribute a specific "suitability" to a given piece of land.

Taking account of prevailing socio-economic conditions in classifying farm types is often a very complicated process. The main problem is the need to identify and grade the factors most likely to affect the technical choice of products, especially as one farm may combine many products. These factors include the relative scarcity of resources (land, labour power, capital), opportunities for off-farm work, land tenure systems, price fluctuations, forms of credit available, ease or difficulty of obtaining inputs, etc.

Given the multitude of factors and conditions affecting choices or changes of production system and the difficulty of putting them in ranking order at first glance, researchers use
exploratory statistical methods such as principal component analysis and correspondence analysis, in the hope of rapidly picking out the most discriminant combination of interdependent criteria. To do this they carry out statistical surveys on fairly large random samples. But the results are rarely conclusive: if one launches into a large-scale survey without any precise idea of the realities one is trying to examine, it is hard to pinpoint the quantitative and qualitative variations that need to be measured. Without sufficiently well-grounded hypotheses on the actual farming situation one is trying to study and how it works, premature use of statistical methods like factor analysis almost always gives disappointing results. The question, then, is how to gradually build up such hypotheses.

The main point is to bring to light, very rapidly, the concrete mechanisms that logically lead farmers to run different production systems. To revealing the causal relations in the chain of events leading to differentiation among holding types, and leading farmers to diverge towards different production systems, historical analysis is indispensable. One should analyse and interpret the pattern of historical change that has occurred on the holdings, taking as a prior hypothesis that any farmer has an interest in applying the production system that is best able to reproduce his/her material conditions of existence. Their ecological and economic situations being different, the different categories of farmer have not all been able to accumulate the same means of production and do not necessarily have an interest in maximizing or optimizing the same economic ratios to raise their living standards. The farm typology must therefore highlight differences in historical development and take account of the wide range of management criteria that shape farmers' decisions in the running of their respective production systems.

III - Cost-effectiveness criteria

From the farmer's point of view, the meaning of "cost effectiveness" in a production system can differ very widely according to the conditions under which he or she works. The criteria applied in assessing the interest he or she may have in adopting a given technique will vary greatly from one type of farmer to another.

Many researchers point out, for example, that the poorest farmers often show a certain "risk aversion" and that it is not necessarily in their interests to maximize the mathematical expectation of output or income. It is understandable that farmers in a position of extreme economic insecurity (low resources, dependence on usurers, irregular price fluctuations, etc.) hesitate to borrow money to pay for the necessary inputs and equipment to shift to a new production system, where the profitability of the new system can very high but can also show wide fluctuations. For some farmers, the very real risk of being unable to pay back a loan in a bad harvest year means the risk of having to sell the few assets they have and no longer being able to operate as independent farmers. Where economic, climatic and crop health conditions are highly variable, not all farmers will have an interest in taking the same risks: the same event may be of little consequence for some but catastrophic for others.

Farmers in the most insecure situations generally refuse to invest their money and efforts in production systems that cannot guarantee a certain minimum yield every year. It is to
minimize the risks of a bad harvest that many farmers in Sudano-Sahelian Africa try to cultivate fields scattered over a wide area, in different ecological settings. That way they can hope for a harvest from one field or another, whatever the meteorological conditions of a given year. Growing several different crops in one field, with very different physiological behaviour patterns (millet, cowpea, sorghum, etc.) seems to be a response to the same preoccupation: the different crops being differently affected by climatic conditions, pests and diseases, one or other is likely to yield, come what may. Agronomists should take this into account before suggesting new farming techniques to this group of farmers. And yet agricultural research has always concentrated on single cropping, and we still do not have a thorough understanding of the main types of multiple cropping practiced in semi-arid regions.

When market conditions are unjust and unreliable, it is not in the interests of small farmers to concentrate their production systems on supplying produce for the market. They need first and foremost to produce a varied range of produce for family consumption. However, it is rarely possible for a farmer to produce at home all the staple goods he or she needs, and it will be necessary to sell a part of the farm's output to buy what is lacking. If market conditions are really unfavourable, it may be in the farmer's interests to market only surplus food produce. Farmers growing primarily for subsistence rarely have sufficient money income to buy the chemical fertilizer, commercial crops protection products, machines, etc. so often recommended by extension workers. But these smallholders should not be regarded as incapable of innovating. New techniques are assessed in terms of their potential for maximizing the production of use values: calories and proteins for food, straw and haulm for building, etc. This is particularly the case in the most remote areas, where marketing produce presents major transport problems: crops are then chosen to meet family subsistence needs and the only produce intended for sale is livestock, which can walk to market.

By contrast, where market conditions are much more favourable from the standpoints of produce sale and supply of means of production and consumer goods, it may well be in the farmers' interests to specialize their crop and livestock systems according to the "comparative advantages" of their region, producing for the market even if they have to buy all or part of the requirements for family consumption. Farmers then try to adopt and master the agricultural methods best able to increase their money income and, when this is sufficient, to buy the means of production most appropriate for further maximizing income.

To increase money income, farmers working for the market may have an interest in adopting a more or less intensive production system, depending on the relative scarcity of each of the available resources. Given the abundance of labour power available in the family, smallholders are well advised to adopt labour-intensive production systems so as to maximize income per hectare. This often explains the existence of systems involving a very tight combination of multiple cropping and stock keeping, with products that require a great deal of care but are highly profitable: vegetables, milk, honey, fruit, intercropped cereals and legumes, tuber crops, etc. These systems are run so as to produce a maximum of added value on the small area available, making optimum use of biological processes to upgrade natural resources (photosynthesis, biological nitrogen fixation, pollinization by bees, etc.) and recycling the by-products of each activity (bean
haulm, manure, etc.). This obviously calls for a high labour input per hectare, but this is readily available in a large family, especially as off-farm job opportunities are rare.

The situation is very different in regions where population density is lower. There is still a fair supply of uncultivated land, and in many cases not all the land has been appropriated for private use. To maximize incomes, farmers in these regions run fairly extensive production systems, sowing broadcast, bush fallowing for varying periods and clearing the land for each crop, etc. Systems like this require plenty of space, do not necessarily produce high added value per hectare, but often enable farmers to maximize income per hour of family labour with the few means they have available. A production system based on continuous cropping with indoor stock keeping, for example, would require much more labour per hectare (more frequent weeding, handling and transport of manure, etc.) and would therefore not enable farmers to maximise their income, given the relative scarcity of family labour power, the hectareage available and the low level of equipment. There is no point increasing yield per hectare if the labour used to this end can be more effectively employed in extending the cropping area or finding gainful employment off the farm.

On large holdings where all labour is waged labour, farmers investing money capital seek appropriate techniques and means of production to maximize their rate of profit, given that they could invest in trade, industry, real estate speculation, etc. The choice of techniques and production systems will then depend directly on prevailing price ratios and available opportunities for profit-making elsewhere. Examples of this are to be found on many large ranches: ranching generally requires little investment, and the fact of immobilizing capital in the form of land and livestock is readily offset by rising land prices and the natural growth of the herd.

All this shows the importance of taking account of the economic criteria used by each category of farmer to assess whether or not a given farming technique is worthwhile, rather than considering solely its impact on yield per hectare. To pinpoint the management criteria most representative of how different farmer categories view the "cost effectiveness" of their production systems, a classification of farm types must pay special attention to the following three theoretical postulates:

- The more stable and fair the prevailing trade relations, the more it will be in farmers' interests to gear their activities to specialized production for the market. Where trade relations are very unjust and variable, on the other hand, it may be in their interests to produce largely for family subsistence.

- Only where production conditions are stable and reliable will it be in farmers' interests to maximize the mathematical expectation of output or income. On the contrary, any farmer in a vulnerable situation (debt, mortgage, dependence on landowners, epizootic diseases, etc.) has an interest in minimizing the risk of a very poor year.

- Where farmers have little land, labour power, working capital, etc. at their disposal, it is in their interests to make the most of these resources, taking careful account of the results they can obtain from alternative uses and making ample use of those resources that involve low or zero opportunity costs.
A typology of farm types must take these three postulates into account and posit that farmers have good reasons for trying to implement the production systems that best correspond to their interests. This is not to say that all farmers are equally rational or that there are not a few individuals in each class who display "deviant" or "suicidal" behaviour. But such behaviour soon takes them out of the category in question, and with large samples one can confirm that farmers working under similar conditions run production systems that meet similar management criteria. There is a relatively small number of such systems for each class of farmer.

The question facing planners and project designers is how to empower the different classes of farmer to pursue their respective interests as efficiently as possible and design government action in the technical and economic spheres accordingly. The problem is that, under certain economic and social conditions, it may not be in farmers' interests to maximize their output of added value or, therefore, to use the techniques that would best coincide with the general interest. In this case it is up to the government to modify these conditions such that the farmers, while working in their own interests, can adopt those agricultural techniques and production systems that are best able to meet the needs of society as a whole.

IV - Practical classification procedures

The diagnostic analysis of farming situations can take very different forms according to the circumstances, but project designers usually ask for a quick result that will help them design and formulate appropriate actions. To meet these requirements, a step-by-step approach with progressively closer focus must be taken, beginning with an all-embracing view of a large area (country, region, zone, etc.) and ending with a much tighter, more specific focus (farm, herd, field, etc.). At each stage, attention is paid to the interactions between technical, ecological and socio-economic factors. To identify causal relations and the mechanisms of differentiation, great importance is laid on historical development. At each stage, one must seek to stratify the observed reality into distinct, relatively uniform units (zoning, typologies, etc.). The information gathered at each stage is constantly reinterpreted in the light of features identified at subsequent stages. The final quantifications and synthesis are carried out at the most general level, resulting in a coherent document in which agricultural development problems and potentialities are precisely identified and graded. In this way one can reasonably envisage new techniques appropriate to each case, based on full knowledge of the conditions that must be created before farmers can implement them.

At the regional scale, farmer classification cannot be carried out without previously subdividing the region into relatively uniform units in terms of agricultural development problems, as the different farmer categories are not necessarily evenly distributed in different areas. The purpose of this zoning is to define clearly the agro-ecological potential and socio-economic limitations that shape the choice and evolution of production systems in each place. The work generally begins with gathering and processing all available maps, if such exist, bearing in mind that they were not necessarily drawn up with a view to designing agricultural development projects. The criteria and methods of classification used in each case for demarcating the geographical units and
sub-units must be considered with care. The general approach is to overlay maps dealing with different aspects, at the same scale, to give a quick overview of possible correlations between the different factors, from climate, landform, soils and hydrography through natural and cultivated vegetation, wildlife and domestic animals to economic and social infrastructures, population density, size of holdings, land tenure and ethnic groups, etc. Use can also be made of aerial photographs and satellite images taken at different times, to give a grasp of the dynamics of spatial differentiation.

A next step can be to select a few transects, cutting across the qualitative differences brought to light by the map study, for systematic field observation trips. In the field, one should verify these differences and add new information from observation of the landscape, identifying areas of shrub steppe, open fields, tree savanna, grassland, etc. The important task at this stage is to identify and locate the main forms of anthropization and exploitation of the ecosystems (bush fallowing, pastoralism, lateral fertility transfers, etc.) and to identify the ways in which farmers try to make the most of local resources with the means they have at their disposal (tools, equipment, buildings, etc.).

As a rule, it is also advisable to run surveys or exploratory interviews so as to identify, or obtain more details on, the region's main agricultural development problems. Approaches may differ sharply from one locality to another. However, experience shows that moving on quickly to a sample survey is not the best way, unless one already knows which types of information will be most useful and how the information is to be processed. It is much better to start with open-ended interviews with a few well-informed witnesses to recent changes in agriculture, chosen for their age and professional experience (judgement sampling). Respondents are asked to recount the history of farming practices and social relations in their area. The essential purpose of this kind of interview is to see how farmers have modified their farming systems according to the capital and means of production they have at their disposal and the social relations within which they operate (price system, land tenure system, loans, etc.). In this way one can assess the elements that have shaped the choice and evolution of farm production systems in the area, and bring to light how and why fixed capital accumulation occurs unevenly, leading to specialization by zone and differences between holdings.

The map-based analysis, the field observation and the exploratory surveys can complement each other to help define relatively uniform zones in terms of changes in agriculture, with, for each zone, a provisional typology of holdings, defined according to their history and the production systems adopted. The linchpin of the process is to progress from one hypothesis to another, without trying to gather and process all the available information at once. It is better to make a partial synthesis at each stage, on the basis of which one can formulate a fresh set of pertinent questions and so achieve the goals of the diagnostic analysis step by step. Nonetheless, one needs a sufficiently flexible and rigorous theoretical framework to interpret locally-observed changes correctly and situate them against the broader background of global evolutionary mechanisms in agriculture.

Historical analysis of agricultural change in each zone enables one to identify the main types of holding according to their historical development, with special emphasis on how they relate to the market, capital accumulation trends, technical change and
specialization or diversification of products. It is then possible to characterize their respective production systems in greater detail, with a view to identifying and grading the main technical and economic problems encountered by each class of farmer.

This characterization of production systems must show, for each type of holding, the full range of agricultural techniques and activities involved. It must also explain the differences observed, in terms of the material and financial resources available to the farmers and which economic ratios they need to optimize to reproduce, as best they can, their material conditions of existence. On this basis one can design solutions (or experiments) that are appropriate to the situation of each type of farmer.

To characterize a production system one must carry out case studies, examining in detail the different cropping and livestock systems in use on a small number of pre-selected holdings. Holdings for the case studies are chosen using the provisional typology worked out at the regional analysis stage (judgement sample). At this stage it is not important for the sample to be representative of the whole range of holding types in the region concerned; rather, one wants to know very precisely, for each of the production units in the sample, what class of holding it represents. The number of holdings studied in detail will therefore depend primarily on the diversity or uniformity of the farm types identified in the previous phase. Several holdings of each type should be selected, so as to verify the relative homogeneity of each class. Case studies of unusual or "extreme" cases can also be of great value, inasmuch as understanding their particular features often helps towards a better understanding of the more commonplace situations.

Analysis of each production system begins with a census of the labour force and means of production available on the farm, describing their general characteristics, how they were acquired, at what times of year they are available, and the use to which they are put. The history of the holding then enables one to understand how the system evolved or was introduced, showing how the farmer set up in the first place, the history of successive investments, changes of technique or method, trends in labour productivity (in physical terms), and capital accumulation mechanisms. Observation of fields and herds is an opportunity to study in greater detail the different cropping and livestock systems in operation on the farm. The technical processes inherent in each one are analysed and their performance is briefly assessed in terms of yield per hectare, livestock fertility rates, output per animal, etc. The internal coherence of the production system is checked, observing how the farmer allocates resources among his/her different crop and livestock systems and identifying possible complementarities such as use of straw for bedding stock, manure spreading for crops, animal power for tillage, fertility transfer through stock movements and coralling, etc. Obstacles and bottlenecks that hamper management of the system are identified: labour demand peaks, storage problems, cash flow deficits, more or less periodical imbalance in forage supply, etc. It is then important to make a rapid economic calculation for each cropping and livestock system, identifying:

- annual gross yield per hectare,
- annual intermediate consumption per hectare (proportional consumptions and fixed capital consumption),
- annual added value per hectare,
- labour productivity (added value per labour unit),
- remuneration of the holder and his/her family (once wage labour, taxes, farm rent, etc. have been paid),
- rate of profit, if applicable.

Once this work has been completed, it is possible to compare types of production system according to the logic of how they have evolved and their economic results. As a rule, this confirms that different types of farmer do not necessarily have an interest in optimizing the same economic ratios (gross margin per hectare, hourly remuneration of labour, rate of profit, etc.). The differences observed can be explained by looking at the diversity of conditions under which the systems have been worked in the past and are worked today: geographical location, ecological conditions, prior capital accumulation, availability of labour and means of production, land tenure system, supply and marketing conditions, price relations, etc. On the basis of this kind of analysis, one can design the new conditions that need to be created to steer the evolution of the production systems in one direction or another.

Once the main production system types have been characterized, the next problem is to find out how many people are involved in each and quantify the relative importance of each phenomenon observed. It is also important to check the extent to which the case study results are truly characteristic of the different farm classes and can be extrapolated to all holdings in the same class. Very often, of course, there are no statistical tables available to carry out this work on the basis of the most strongly discriminant variables in the classification. In this case, extensive sample surveys are required at this stage, using fairly large samples. These surveys should concern only a few, readily-identifiable characteristics from among the structural and behavioural variables most capable of explaining differences between holdings. The statistician can then verify the relevance of the criteria selected for the classification (correspondence analysis, calculating correlations, etc.) and determine the distribution of production units among the different classes. The farm holding classification is thus confirmed. However, experience shows that, in many Third World situations, it is difficult to obtain reliable, precise information with a small number of questions. Uncertainty due to the imperfect nature of the information gathered is often much greater than the sampling error. It is for this reason that project designers nowadays often forego such costly but uncertain surveys and restrict themselves to strictly logical extrapolations and rough counts.

V - Choosing appropriate schemes for each type of holding

At the end of the process, the classification of holdings explains how and why the various types of farmer have adopted their current practices and makes it possible to predict how these practices will evolve if the government deems it unnecessary to seek alternatives to the usual type of development scheme. But it also helps planners formulate appropriate schemes for each type of holding, as follows:

- From the strictly technical point of view, it becomes possible to design solutions or experiments to overcome, one by one, the obstacles brought to light in the detailed characterization of the production systems. The key point is to select the techniques
that best coincide with the interests of each type of farmer, taking account of their respective management criteria.

- From the socio-economic point of view, the farm classification enables project designers to imagine the conditions that will give the great majority of farmers an objective interest in changing their production systems so that they are more in line with the common interest, and will give them the means to do so: input subsidies, infrastructures, agricultural credit, land taxation, cooperatives, land reform, etc.

Projects may differ from one type of holding to another, and must be discussed very widely with the categories of farmers concerned. The important point is always to leave the farmers plenty of room for initiative in everything connected with their choice of product, their organization of labour, the application and adaptation of new techniques, etc.
APPENDIX 2

MAPS

1) Namibia: general map
2) Location of the project zone
3) Main agro-ecological zones
4) Location of the three pilot sites
Localisation de la zone d'intervention du projet

Region | Area (Sq.km) | Pop. Est.
-- | -- | --
Omusati | 13,637 | 158,000
Oshana | 5,290 | 159,000
Ohanguena | 10,582 | 178,000
Oshikoto | 26,607 | 176,000
APPENDIX 3

MISSION CHRONOLOGY

Sunday June 27th: Arrival Windhoek on flight AF 0438
Reception by project team (Messrs. Dominique Mas, Olivier Durand and Fabrice Renaud).

Monday June 28th: Reading of preparatory documents
Lunch with Mr. Yves Maire, Head of the French Cooperation and Cultural Action Mission.

Tuesday June 29th: Journey from Windhoek to Oshakati.

Wednesday June 30th: Travelling around the Cuvela inland delta (the "oshanas" region):
Endola, Ongenga, Okalongo, Oshikuku.

Thursday July 1st: Visit to Lake Oulushandja area: Eunda and Onesí, Ruacana falls.

Friday July 2nd: Omakongo, Odombe and Oshandi (Centre-Northeast region)

Saturday July 3rd: Northeast region: Eenhana, Okongo, Omauni and as far as the Kavango border.

Sunday July 4th: Reading background documents.

Monday July 5th: Southwest region: Okahao, Etilyasa, Okaholongo, Oruperengwa and as far as the Etosha Park boundary.

Tuesday July 6th: Report-back meeting with project team.

Wednesday July 7th: Interview with Mr. D.M. Greef, manager of the Standard Bank in Oshakati.
Visit to Bush Master, farm equipment manufacturer.
Visit to Oshakati Rural Development Centre.
Visit to Green Namibia Community Project tree nursery.

Thursday July 8th: Writing of provisional report.

Friday July 16th: Mission report to Messrs. de Klerck and P. Hugo, Director and Deputy Director of Agriculture at the Ministry of Agriculture, Water and Rural Development.
Mission report to Mr. Yves Maire, Head of the French Cooperation and Cultural Action Mission and his Deputy, Mr. Jean-Marie Langlais.
Dinner with Mr. Michel Mallet, Head of the CRIAA (Centre de Recherche-Information-Action pour le développement en Afrique) for Namibia.

Saturday July 17th: Reception by French Consul. Interview with the French Ambassador.

Sunday July 18th: Departure for Paris on flight AF 0439.
APPENDIX 4

LITERATURE CONSULTED FOR THE PURPOSES OF THE MISSION

1) General literature on Namibia and Namibian agriculture


2) Literature on northern Namibia


APPENDIX 5

Franco-Namibian Rural Development Support Project

AGRARIAN SYSTEMS ANALYSIS SUPPORT MISSION

TERMS OF REFERENCE

The background to the survey:

The pattern of agriculture in Namibia is bipolar: the Centre and South of the country are occupied by large commercial estates, mainly given over to ranching cattle and Karakul sheep, while most of the country’s population practices subsistence farming in the former homelands of the North.

45% of the country’s population live in the Northern region, formerly a homeland known as Ovamboland. The predominant activity is livestock raising, and the main crops are millet and sorghum. Cropping systems are extensive: no use of mineral fertilizer, little or no investment in means of production. Yields are low (around 250 kg/ha on average for millet) owing to low-efficiency farming techniques, lack of agricultural labour power, declining soil fertility and unreliable rainfall. In stock farming, priority is given to ownership of a large cattle herd. The cattle trade is not very developed. Pastoral activity is now in crisis owing to degradation of forage resources due to overgrazing and recent droughts. Off-farm incomes seem to be quite high and are a major factor in social differentiation between holdings. Migration is the main source of off-farm cash income.

Rural development in this region is confronted with a serious combination of limitations:

- Natural limitations:
  * limited water resources, salinity;
  * mediocre land quality (texture, fertility, salinity).

- Socio-cultural limitations:
  * welfare mentality;
  * very weak social fabric.

- Economic limitations:
  * weak development of industrial, commercial and artisanal structures, informal sector virtually non-existent;
  * limited access to markets outside the region owing to the quarantine line, designed to protect cattle on the commercial farms from the epizootic diseases of the North.
ACTIVITIES OF THE NORTH NAMIBIA
RURAL DEVELOPMENT SUPPORT PROJECT

The Franco-Namibian Cooperation Agency is preparing to launch an integrated rural
development project for northern Namibia. This project should start up around July 1993.
For the next three years, it will mainly concern the regions of Ohanguena, Omusati,
Oshana and Oshikoto (former Ovamboland). The priority will be to increase yields and
revenues in rural areas, but the project will also be aiming to improve the operational
capacity of the Namibian Agriculture Ministry's regional services, by testing the
research-and-action approach in local areas and teaching this approach to Ministry
managers and technicians.

The project will therefore be organized around three keynote themes:

- Improving production systems through research-and-development activities, starting
  with three pilot sites representing three different ecosystems;

- Support for local investment initiatives, setting up funds to finance very small
  investment projects initiated and carried out by local communities;

- Support for the regional technical services, to strengthen their capacity to monitor
  rural development schemes and analyse farming systems.

Owing to the military and political situation of the past few decades, very little reliable
information is available at present to facilitate understanding of local farming systems.
To prepare for the project, the technical support team carried out brief surveys among
the farmers to gain a qualitative understanding of how the local farming systems operate
and identify the obstacles they face. Physical and economic zoning was carried out and
fifteen villages were selected according to these zones. Preliminary discussions with
headmen, leading figures and villagers provided some general information on the
communities' problems and needs, the organization of the villages and the production
systems. Work continued with individual interviews with farmers, providing a closer
knowledge of the cropping and livestock systems, farm-related activities and non-farm
activities.

A synthesis of findings from these surveys is to be published in a provisional report on
agrarian systems in Ovamboland. This document should be available in early June.

TERMS OF REFERENCE OF THE MISSION

The present mission is intended to provide support for the regional services of the
Namibian Ministry of Agriculture and the project team. It is one of a series of
preliminary missions on specific themes (livestock, agronomy research, etc.) designed to
help the project fine-tune its content and strategy, with the short-term aim of working
out a research-and-development program for each of the three pilot sites and a program
of complementary socio-economic investigations.
For each site, the consultant shall advise the project on the identification and scheduling of the research-and-development activities to be undertaken during the three years of Strand One of the project (the pilot sites).

He shall propose a methodology for implementing these schemes. The approach selected must enable the project to start practical rural investment activities rapidly and enable easy training of Agriculture Ministry staff.

He shall define the appropriate method for monitoring and evaluation of activities.

Lastly, alongside the research-and-development schemes, but within the broader framework of the entire project zone, the consultant shall propose a programme of surveys and thematic studies to be carried out over the next three years. The aim of this research shall be to continue and improve on the capitalization of knowledge of the North Namibian rural economy. Findings shall be used directly in fine-tuning project activities, especially research-and-action activities. In the longer term, they must also be helpful in evaluating Namibia's agricultural policy in this region.

To carry out his mission, the consultant shall make use of existing literature and the findings of agrarian system surveys carried out in the preparatory phase of the project. He shall make a series of field trips and interviews with village communities. To formulate his proposals, the consultant will be able to use the project presentation report, which outlines the main themes of the project's activities.

At the close of his mission, the consultant shall present his preliminary conclusions and proposals at a report-back meeting with senior staff at the Ministry of Agriculture.

The mission report shall be drawn up in English and French; ten copies (five in English and five in French) shall be submitted to the French Ministry of Cooperation and Development. Both versions shall be submitted no later than one month after the end of the trip to Namibia.

Desirable profile: senior agro-economist with a solid experience of research/development projects in Africa (identification, implementation and monitoring of R&D schemes; training in R&D). A good command of English is indispensable.

Duration: 2 weeks abroad + 1 week in France.

Probable date: June.
<table>
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<th>ZONE</th>
<th>Rainfall (mm)</th>
<th>Population density per km²</th>
<th>Vegetation</th>
<th>Water resources</th>
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<td>300</td>
<td>0 to 5</td>
<td>Shrub steppe</td>
<td>Lithosols</td>
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<tr>
<td>II</td>
<td>300</td>
<td>0 to 5</td>
<td>Mopane tree savanna</td>
<td>Arenosols (calcicoreous)</td>
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<td>350 to 400</td>
<td>25 to 50</td>
<td>Tree savanna and flood recession grassland</td>
<td>Arenosols and sodic soils (Solonetz)</td>
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<td>300 to 350</td>
<td>0 to 5</td>
<td>Flood recession grassland</td>
<td>Halomorphic soils</td>
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<tr>
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<td>450 to 500</td>
<td>0 to 5</td>
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<td>Arenosols</td>
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