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THE CHANGING RELATIONSHIP OF FORESTRY AND AGRICULTURE IN BURMA

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TABLE OF CONTENTS

I. INTRODUCTION

II AGRICULTURE/FORESTRY INTERRELATIONS AND PROBLEMS
- A.LAND FOR AGRICULTURAL DEVELOPMENT
- B.LOW COST ENERGY FOR FARM ACTIVITIES
- C.FODDER FOR LIVESTOCK
- D.SUFFICIENT WATER SUPPLIES
- E.EROSION PROTECTION

III.SUMMARY AND PROBLEM IDENTIFICATION
- A.VALLEY PROBLEMS
- B.HILL PROBLEMS

IV.GOVERNMENT RESPONSES

V.RECOMMENDATIONS

APPENDICES
- A.FORESTRY-ORIENTED PROJECTS OF RECENT YEARS

I. INTRODUCTION

BURMA'S EXTENSIVE FORESTS OFFER GREAT POTENTIAL AS A SOURCE OF WOOD AND WOOD PRODUCTS; AS A LOW COST ENERGY RESOURCE; AS A STOCKPILE OF NON-WOOD PRODUCTS SUCH AS FRUITS AND NUTS, GUMS AND RESINS, TANNINS, OILS, DRUGS AND MEDICINES; AS GRAZING LANDS FOR LIVESTOCK; AS A HABITAT FOR FISH AND WILDLIFE; AS A GENETIC STOREHOUSE OF GREAT DIVERSITY; AS A MEANS OF PROTECTING AND CONSERVING THE NATION'S SOILS AND WATER SUPPLIES; AND AS A RECREATIONAL HAVEN.

CURRENT INDICATIONS ARE THAT THESE POTENTIALS ARE BEING WASTED; THAT RATHER THEN BEING MAINTAINED AND USED WISELY, THE FORESTS ARE BEING DEPLETED AND DESTROYED AT A RAPID RATE ALONG WITH THEIR POWERS OF MULTIPLE CONTRIBUTION. THE EVIDENCE IS TO BE FOUND ON THE LAND AND IN THE MARKET PLACE; IN MASSIVE AND WIDESPREAD SOIL EROSION, RAPID WATER RUNOFF, SILTING OF DAMS, RISING PRICES OF CHARCOAL AND FUELWOOD, LOCAL SHORTAGES OF CONSTRUCTION WOOD, DWINDLING WILDLIFE, AND SHRINKING FOREST ACREAGES.

IN RECENT YEARS, AT LEAST 20 DEVELOPMENT PROJECTS REPRESENTING OVER 300 MILLION DOLLARS OF EXPENDITURE HAVE BEEN MOUNTED OR PROPOSED TO GENERATE GREATER ECONOMIC AND SOCIAL RETURNS FROM FORESTRY. THESE PROJECTS ARE REVIEWED AND PROFILED IN APPENDIX A. WHAT STANDS OUT IN THAT REVIEW IS THE HEAVY EMPHASIS SO FAR GIVEN TO INCREASING THE EFFICIENCY OF COMMERCIAL FOREST OUTPUT. THERE IS REASON FOR THIS ORIENTATION. TEAK, AFTER ALL, IS BURMA'S SECOND LARGEST EXPORT AND ACCOUNTS FOR MORE THAN ONE-FOURTH OF HER FOREIGN EXCHANGE EARNINGS. BUT THERE IS ANOTHER AREA THAT DEMANDS DEEP CONSIDERATION. EXCEPT FOR THE PROPOSED "LOCAL SUPPLY FUELWOOD PLANTATION PROJECT" AND THE "INTEGRATED WATER MANAGEMENT PROJECT", BOTH OF WHICH ARE PENDING, NEGLIGIBLE ATTENTION HAS BEEN GIVEN TO THE FORESTRY NEEDS AND PROBLEMS OF THE AGRICULTURAL SECTOR. YET AGRICULTURE IS THE GREATEST AGENT OF DEPLETION OF BURMESE FORESTS AND, AT THE SAME TIME, HAS THE GREATEST LONG TERM NEED FOR THEIR CAREFUL MANAGEMENT, MAINTENANCE AND IMPROVEMENT

II. AGRICULTURE/FORESTRY INTERRELATIONS AND PROBLEMS

THE USES OF THE LAND ARE SO INTERTWINED THAT EVERY FORESTRY ACTIVITY, HOWEVER REMOTELY CONNECTED WITH AGRICULTURE, HAS ITS ECONOMIC OR SOCIAL EFFECT ON THAT SECTOR. BUT FIVE GREAT AGRICULTURAL NEEDS EXERT DIRECT AND POWERFUL INFLUENCE ON FOREST CONDITIONS.

°. THE NEED FOR LAND FOR A GROWING AGRICULTURAL POPULATION,
2. THE NEED FOR ENERGY FOR COOKING, HEATING AND OTHER FARM OPERATIONS,
3. THE NEED FOR FODDER FOR EXPANDING DOMESTIC ANIMAL PRODUCTION,
4. THE NEED FOR STABLE WATER SUPPLIES FOR FARM PRODUCTION AND HOME USE
5. THE NEED FOR SOIL PROTECTION TO PREVENT EROSION, PROTECT AGAINST DECLINING PRODUCTIVITY AND REDUCE SILTATION OF DAMS AND WATER COURSES.

THE FOLLOWING PARAGRAPHS EXPLORE BRIEFLY THE NATURE AND DIMENSION OF THESE NEEDS AND HOW THEY ARE CURRENTLY BEING MET.

A. LAND FOR AGRICULTURAL DEVELOPMENT

BURMA'S GROWING POPULATION, SOME 75% OF WHICH IS RURAL, AND CLOSE TO 2/3 OF WHICH IS EMPLOYED IN AGRICULTURE, MUST CONTINUALLY SEEK AND DEVELOP NEW AGRICULTURAL CAPACITY, NOT ONLY TO SUSTAIN ITSELF BUT ALSO TO HELP MEET RISING EXPORT REQUIREMENTS. CONCEPTUALLY, THERE ARE TWO WAYS OF DOING THIS: BY RAISING PRODUCTIVITY OF THE INDIVIDUAL ACRE SO IT CAN SUPPORT MORE PEOPLE, OR BY OPENING UP NEW LANDS FOR AGRICULTURAL USE. BOTH PATHS HAVE BEEN TRAVELED. BETWEEN 1970 AND 1981, PER-ACRE YIELDS OF BURMA'S LARGEST CROP, RICE, INCREASED BY OVER 60%. AND AVERAGE FARM SIZE CONTINUED A LONG DECLINE TO ABOUT 7.5 ACRES WITHOUT MAJOR SACRIFICE TO DEPENDENT FAMILIES. MEANWHILE, TWO ALTERNATIVE SOURCES OF NEW LAND FOR AGRICULTURAL USE WERE EXPLOITED. ONE WAS UNTENANTED LAND PRESIDED OVER BY TOWN COUNCILS WHO ALLOCATED ACREAGE TO RESIDENTS WHO COULD LEGITIMATELY APPLY FOR IT. THE OTHER WAS LAND HELD BY THE GOVERNMENT IN FOREST,RESERVES OR COMMERCIAL STANDS WHICH, IF ILLEGITIMATELY CLEARED OF FOREST, OFTEN PROVIDED FARM YIELDS EQUAL TO OR EVEN SUPERIOR TO THOSE OF ALLOCATED LANDS.

HOW MUCH FOREST LAND IS USED FOR THESE PURPOSES? DETAILED STATISTICS ARE SCANTY. BUT RECENT SATELLITE PHOTOGRAPHY SUGGESTS THAT SOME 600,000 HECTARES ARE BEING CLEARED OF FORESTS EACH YEAR, AND THAT TOTAL FOREST COVER, LONG BELIEVED TO BE CLOSE TO 60% OF TOTAL NATIONAL ACREAGE, IS NOW CLOSE TO 40%.

VERY LITTLE OF THE FOREST CLEARING IS LIKELY TO BE DIRECTLY DUE TO LOGGING, EITHER LEGAL OR ILLEGAL. SOME OF BURMA'S PINE STANDS MAY INVITE CLEARCUTTING, BUT IN HER EXTENSIVE HARDWOOD FORESTS, HIGH VALUE SPECIES ARE IN MIXTURE WITH MANY OTHERS OF LOW OR NO COMMERCIAL VALUE, SO LOGGING OPERATIONS ARE TYPICALLY SELECTIVE, AND THE RESIDUAL STANDS AFTER LOGGING ARE FAIRLY DENSE.

UNOFFICIAL ESTIMATES OF THE TYPES OF LANDS ALLOCATED BY TOWN COUNCILS SUGGEST THAT FORESTED AREAS CURRENTLY REPRESENT ONLY A SMALL PROPORTION OF THE TOTAL.

FIRE, BOTH NATURAL AND MEN-CAUSED, ACCOUNTS FOR SOME OF THE FOREST REMOVALS. RURAL RESIDENTS HAVE SEVERAL REASONS FOR SETTING FIRES. FOR EXAMPLE, FIRE TEMPORARILY GREENS THE GRASS FOR GRAZING, IT IS A TECHNIQUE USED IN HUNTING WILD ANIMALS, FOR PROMOTING PHYSICAL ACCESS IN DENSE COVER, AND FOR PROMOTING THE GROWTH OF JUVENILE LEAVES OF TREES AND SHRUBS WHICH HAVE UTILITY IN PACKAGING AND FOR COTTAGE INDUSTRIES. DURING THE DRY SEASON, SAY IN DECEMBER AND JANUARY, THE HILLS ARE ALIVE WITH FIRES STARTED FOR THESE PURPOSES. MANY OF THESE FIRES DESTROY ONLY THE UNDERGROWTH, LEAF LITTER AND YOUNGER TREES. THEIR NET EFFECT IS PRIMARILY TO DEGRADE RATHER THAN TO DESTROY THE FOREST COVER.

BY FAR THE LARGEST CONTRIBUTOR TO FOREST CLEARING IS THE FARMER SEEKING NEW AGRICULTURAL LAND. TWO GROUPS ARE INVOLVED. ONE CONSISTS OF TAUNGYA1/ OPERATORS (HILL FARMERS), WHO MOVE FREQUENTLY FROM PLACE TO PLACE. THE OTHER CONSISTS OF SEDENTARY VALLEY FARMERS WHO SEEK TO EXPAND THEIR LANDS OR TO ACCOMMODATE FOR FAMILY GROWTH.

1/ IN BURMESE, THE TERM "TAUNGYA" MEANS "HILL CULTIVATION" AND IS OCCASIONALLY USED IN THAT SENSE IN THIS PAPER.

IN HILL AGRICULTURE, THE FARMER CUTS ALL TREES AND OTHER LARGE GROWTH ON AN AREA SUFFICIENT FOR HIS NEEDS (E.G. 2-4 ACRES). THE MATERIAL IS LEFT TO DRY. JUST BEFORE THE MONSOON RAINS IT IS BURNED. THE INTENSE FIRE CONSUMES THE TREES, DESTROYS THE GROUND COVER, KILLS THE WEEDS AND BAMBOO, AND PRODUCES QUANTITIES OF WOOD ASHES TO IMPROVE SOIL FERTILITY. AS THE RAINS BEGIN, HE PLANTS HIS CROPS ON THE MINERAL SOIL.

NORMALLY, AFTER TWO OR THREE SEASONS SOIL FERTILITY DECLINES SUBSTANTIALLY ON THE CLEARED AREA, AND FAST-GROWING WEEDS BEGIN TO INVADE. AT THAT POINT, THE FARMER SHIFTS TO ANOTHER AREA AND REPEATS THE PROCESS. THE RULE OF THUMB IS THAT A CLEARED AREA, LEFT ALONE FOR ABOUT TWO DECADES, WILL REVERT TO APPROXIMATELY ITS ORIGINAL FORESTED CONDITION. SO THE PROCESS, ON A CYCLE OF TWENTY YEARS OR MORE, CAN PERSIST WITHOUT SUBSTANTIAL FOREST DETERIORATION.

GRADUALLY RISING NUMBERS OF HILL FARMERS, AND OTHER, ALTERNATIVE USES FOR FOREST LANDS (AS FOR VILLAGE EXPANSION AND PERMANENT AGRICULTURE) HAVE DIMINISHED THE CYCLE. IN SOME AREAS OF BURMA, IT APPEARS THAT IT IS LESS THAN TEN YEARS BEFORE THE ONCE-CLEARED LAND IS BROUGHT AGAIN UNDER CULTIVATION. IT IS INEVITABLE THAT YIELDS ARE LOWER AND WEEDS INVADE FASTER. THUS, A LARGER AND LARGER POPULATION OF HILL FARMERS BECOMES CAUGHT IN A DWINDLING SPIRAL WHICH LEADS ONLY TO GREATER POVERTY. THERE ARE OTHER, RELATED LOSSES TOO. FIRES GET AWAY AND BURN MUCH LARGER AREAS THAN PLANNED. IN SOME AREAS (E.G. THE CHIN HILLS) THE SLOPES ARE EXTREMELY STEEP AND SOIL EROSION IS EXCESSIVE. AND, BECAUSE OF THE MORE OR LESS COMPLETE BURNING, VALUABLE TREE SPECIES GO UP IN SMOKE RATHER THAN SERVING OTHER USES.

DUE TO THEIR ISOLATION, LACK OF SCHOOLING, LACK OF ALTERNATIVE SKILLS AND INBRED SHYNESS, HILL FARMERS AND THEIR CHILDREN DO NOT ESCAPE EASILY FROM THE SPECIALIZED SOCIAL MILIEU THEY HAVE ESTABLISHED. THE GENERAL TENDENCY IS TO PERPETUATE THE DOWNWARD SPIRAL INTO A DEGRADED FOREST ENVIRONMENT AND INCREASING POVERTY.

THE SEDENTARY, PREDOMINANTLY VALLEY-BASED FARMERS TURN PRIMARILY TOWARD COUNCIL-CONTROLLED LANDS WHICH ARE STILL RELATIVELY PLENTIFUL, AND ONLY PERIPHERALLY TOWARD LOCAL FORESTS TO HELP MEET LAND NEEDS. NEVERTHELESS, THEIR IMPACT ON FORESTS IN THE VALLEYS AND LOW SURROUNDING HILLS HAS BEEN SUBSTANTIAL.

IN THE VALLEYS, ONE CAN POINT TO PARTICULAR RESERVED FORESTS OF FAIRLY LARGE SIZE THAT NO LONGER EXIST. THE LAW HAS NOT BEEN CHANGED. THOSE FORESTS ARE INVIOLATE. BUT WHERE THEY ONCE STOOD ONLY RICE GROWS NOW. GRADUAL ENCROACHMENT FOR FIREWOOD, GRAZING AND, ULTIMATELY, AGRICULTURAL EXPANSION HAS SIMPLY SWALLOWED THEM UP. THE PROSPECT FOR THE FARMER ON THIS KIND OF LAND IS FOR YIELDS TO BE MAINTAINED THROUGH GRADUAL ADOPTION OF ACCEPTED AGRICULTURAL TECHNIQUES.

THUS, AMONG VALLEY FARMERS FOREST CONVERSION TO MEET EXPANSION NEEDS IS MORE OFTEN A CONVENIENCE THAN A NECESSITY, AND MORE OFTEN PERMANENT THAN TEMPORARY. THE USUAL PROCESS IS EXPANSION ONTO FORESTED AREAS ALREADY DEGRADED BY INDISCRIMINATE GRAZING AND FUELWOOD CUTTING.

TAUNGYA CLEARINGS DO NOT REPRESENT PERMANENT CONVERSION TO AGRICULTURE, BUT TOTAL ACREAGE CUT EACH YEAR TENDS TO RISE AS THE POPULATION RISES. THIS IS BECAUSE OPERATORS AND THEIR FAMILIES HAVE FEW OTHER WORK ALTERNATIVES. THE INCREASING PRESSURES FOR LAND PROMOTE INCREASING FOREST DETERIORATION. THIS KIND OF LAND CLEARING ACCOUNTS FOR THE GREAT BULK OF THE FOREST REMOVALS EACH YEAR.

B. LOW COST ENERGY FOR FARM ACTIVITIES

IN RECENT YEARS, BURMA LIKE MUCH OF THE REST OF THE DEVELOPING WORLD, HAS SUFFERED CUTBACKS IN LOW COST, PETROLEUM-BASED ENERGY PRODUCTS EVEN THOUGH SHE HAS HER OWN OIL SUPPLIES. FOR PRIORITY REASONS, KEROSENE, A POPULAR FUEL AMONG THE RURAL MAJORITY AND POORER URBANITES, HAS ALL BUT DISAPPEARED FROM THE MARKET PLACE. ALTHOUGH BURMA'S ENDOWMENTS INCLUDE SUBSTANTIAL GAS FIELDS, THEIR DEVELOPMENT, TO THE POINT THAT NATURAL GAS SUPPLIES WILL BE READILY AVAILABLE TO THE URBAN POOR AND TO AGRICULTURISTS THROUGHOUT BURMA, SEEMS MANY YEARS AWAY.

THE NATURAL RESPONSE TO SHRINKING KEROSENE SUPPLIES, PARTICULARLY FOR COOKING, HEATING AND OTHER HOME USES, HAS BEEN TO RETURN TO THE USE OF WOOD AND CHARCOAL. THE QUANTITY REQUIRED IS IMMENSE. BURMA'S ESTIMATED AVERAGE CONSUMPTION OF 100 CUBIC FEET OF FUELWOOD PER FAMILY PER YEAR NOW GENERATES A TOTAL REQUIREMENT OF CLOSE TO 17 MILLION TONS , OR MORE THAN THIRTY TIMES THE AMOUNT OF TEAK HARVESTED, AND THE QUANTITY INCREASES EVERY YEAR.

BECAJSE THE REQUIREMENT IS SO LARGE, FORESTS NEAR THE POPULATION CENTERS ARE GRADUALLY BEING DEPLETED AND LOCAL PRICES ARE INCREASING. IN AREAS VISITED BY THE TEAM (EXCEPT IN TAUNGGYI) CHARCOAL PRICES WERE FOUND TO HAVE RISEN FROM 60 TO 100% IN THE LAST FOUR YEARS. FARMERS IN THOSE AREAS, AND EVEN IN SOME OF THE LESS DENSELY POPULATED HILL AREAS, WERE NOW TRAVELING 3-5 DAYS (ROUNDTRIP) FOR A CARTLOAD OF WOOD. AT THE NORMAL RATE OF 4-5 CARTLOADS OF WOOD PER FAMILY PER YEAR, THIS MEANT AN OUTLAY OF FROM 12-25 WORKDAYS PER YEAR SPENT ON FUEL PROCUREMENT. ALTHOUGH SUCH TRIPS MAY HAVE OTHER SOCIAL, TRADE AND RELIGIOUS RETURNS, THEIR OPPORTUNITY COSTS MUST IN MANY CASES BE SIGNIFICANT. SO FOREST DEPLETION NOT ONLY STEALS AWAY THE TIME THAT MIGHT BE PUT TO OTHER INCOME-EARNING ENTERPRISES, BUT ALSO INCREASES THE HUMAN AND ANIMAL ENERGY THAT MUST BE EXPENDED TO FIND, GATHER AND TRANSPORT THE REQUIRED AMOUNTS OF WOOD ENERGY.

THERE IS STILL ANOTHER DIMENSION TO THE PROBLEM. IF CURRENT TRENDS CONTINUE, MOST OF THE CUTOVER LANDS NEVER WILL REFOREST THEMSELVES. ALTHOUGH THE LOCAL HARDWOODS HAVE STRONG REGENERATIVE POWERS, THE COMPOUND PRESSURES FOR AGRICULTURAL LAND, FOR GRAZING, AND FOR SUCH ADDITIONAL FUELWOOD AS MAY BE PRODUCED WILL TEND NOT TO PERMIT THEIR REGROWTH. ALREADY, IN SOME AREAS OF THE DRY ZONE, TREE ROOTS ARE BEING EXTRACTED AND USED AS FUEL. THE NEXT LOW-COST ALTERNATIVE WILL BE TO BURN FARM ORGANIC MATERIALS SUCH AS STRAW AND DUNG. THE INEVITABLE RESULT IS FURTHER DETERIORATION OF SOIL FERTILITY AND WATER ABSORBTIVE CAPACITY, AND FURTHER AGRICULTURAL DECLINE.

THE FUELWOOD PROBLEM TODAY IS PRIMARILY ASSOCIATED WITH POPULATION CENTERS AND SEDENTARY AGRICULTURE. IT IS MORE A "VALLEY" PROBLEM THAN A "HILL" PROBLEM, AND MORE OF A PROBLEM FOR THE POOR THAN FOR THE RICH. FURTHERMORE, IT IS GETTING WORSE. RISING PRICES, LONGER DISTANCES OF TRAVEL, SMALLER AND SMALLER TREES TO HARVEST, INCREASING ILLEGAL ENCROACHMENT ON PROTECTED FORESTS, AND GROWING POPULATION PRESSURES SPELL OUT THE GRADUAL DECLINE AND DISAPPEARANCE OF THE REPRODUCIBLE RESOURCE ON WHICH THE GREAT BULK OF FARMERS AND URBAN POOR MIGHT HOPE TO RELY FOR FUEL IN THE FORESEEABLE FUTURE. NO OTHER RESOURCE PROBLEM IS AS LARGE, WIDESPREAD AND CRITICAL TODAY IN BURMA AS THE PROSPECT OF A LARGE PROPORTION OF THE URBAN AND RURAL POPULATION WITHOUT THE MEANS TO COOK THEIR FOOD AT PRICES OR ENERGY OUTLAYS THEY CAN AFFORD.

C. FODDER

A THIRD MAJOR NEED OF BURMESE AGRICULTURE IS FODDER FOR DOMESTIC ANIMALS. LIVESTOCK PRODUCTION IN BURMA IS SUBSTANTIAL. OFFICIAL FIGURES FOR DOMESTIC GRAZING POPULATIONS 1/ ARE AS SHOWN IN TABLE 1. DURING THE PAST FIVE YEARS, THE NUMBERS OF CATTLE AND BUFFALO HAVE INCREASED BY ABOUT °3%; THOSE OF SHEEP AND GOATS BY 64%. SINCE CURRENT DEMANDS FOR LIVESTOCK PRODUCTS ARE NOT BEING MET, TOTALS MAY BE EXPECTED TO CONTINUE TO INCREASE MATERIALLY DURING THE NEXT FEW YEARS.

TABLE 1. NUMBERS OF LIVESTOCK IN BURMA BY SELECTED TYPES, 1978-84, IN THOUSANDS

TYPE/YEAR	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
CATTLE	7932	8307	8531	8857	9147	9338
BUFFALO	1769	1817	1901	1969	2018	2049
SHEEP/GOAT	800	805	846	1019	1173	1321

THESE ANIMAL POPULATIONS ARE NOT EVENLY DISTRIBUTED THROUGHOUT BURMA. FIGURE 1 SHOWS APPROXIMATE DISTRIBUTION BY POLITICAL DIVISIONS. WHAT IT DOES NOT SHOW IS THEIR FURTHER CONCENTRATION NEAR POPULATION CENTERS.

MOST OF THE CATTLE AND BUFFALO ARE OWNED BY SMALL FARMERS WHO USE THEM AS DRAFT ANIMALS. A FARM OF NEAR-AVERAGE SIZE (SAY 5 ACRES) WITH COMMUNAL GRAZING LANDS NEARBY CAN ADEQUATELY SUPPORT TWO GRAZING ANIMALS. THEY DO NOT NORMALLY RANGE WIDELY AND USUALLY RETURN FROM THE GRAZING AREAS EACH EVENING.

1/ EXCLUDING HORSES, WHICH ARE NUMEROUS IN POPULATION CENTERS OTHER THAN RANGOON AND EXERT IMPORTANT PRESSURES ON NEARBY GRAZING LANDS.

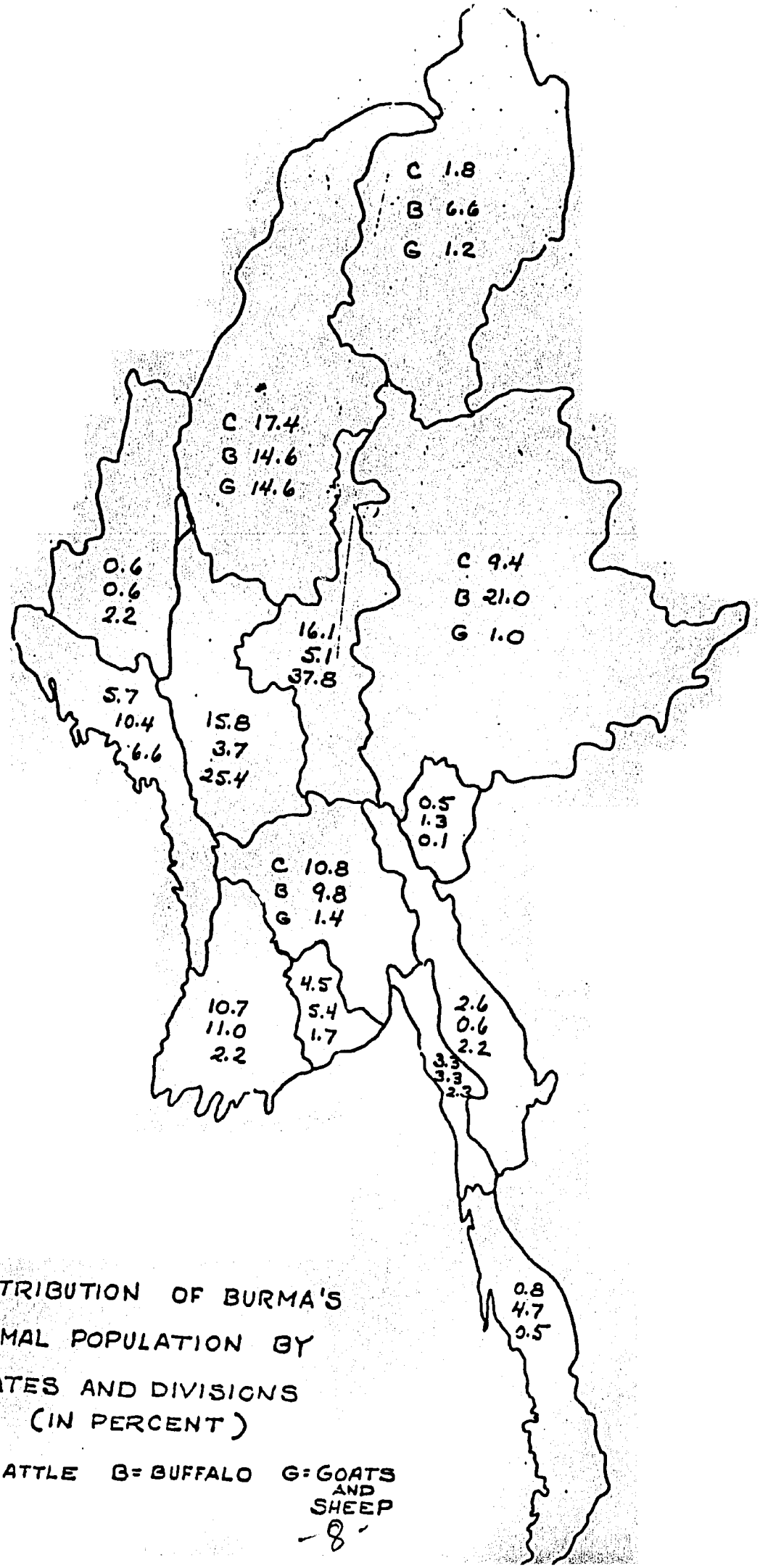


FIG 1. DISTRIBUTION OF BURMA'S ANIMAL POPULATION BY STATES AND DIVISIONS (IN PERCENT)

C = CATTLE B = BUFFALO G = GOATS AND SHEEP

GOATS (AND SHEEP), BY CONTRAST, ARE RAISED PRIMARILY FOR SLAUGHTER IN THE LARGER CITIES. THEIR HEAVIEST CONCENTRATIONS ARE IN THE CENTRAL, DRY BELT OF BURMA, WHICH IS NOT WELL SUITED TO CATTLE OR BUFFALO. THEY TEND TO ROAM WIDELY ON THE EXTENSIVE SHRUB AND GRASSLANDS. IT HAS BEEN FREQUENTLY POINTED OUT BY OBSERVERS THAT THEIR OVERGRAZING ADDS TO THE SERIOUS SOIL EROSION IN THAT ZONE. SEASONAL MIGRATIONS OF LIVESTOCK OCCUR THERE WHEN FOOD SUPPLIES BECOME SCARCE. LARGE ROADSIDE TREES MAY BE COMPLETELY STRIPPED OF THEIR BRANCHES BY HERDSMEN TO PROVIDE THE FODDER NECESSARY FOR SURVIVAL.

FODDER RESOURCES FOR CATTLE, BUFFALO, GOATS AND SHEEP OBSERVED BY THE TEAM APPEARED TO BE ADEQUATE BUT MARGINAL. GRAZING LANDS, PASTURES AND VILLAGE COMMONS APPEAR TO BE TYPICALLY OVERGRAZED AND NOT CAPABLE OF CARRYING A MUCH HEAVIER ANIMAL POPULATION. RISING NEEDS FOR ANIMAL PRODUCTS SOON WILL REQUIRE ACTIVE DEVELOPMENT OF ADDITIONAL SOURCES OF ANIMAL FODDER.

THIS GRAZING AND FEED PROBLEM, AT LEAST CURRENTLY, IS PREDOMINANTLY A VALLEY PROBLEM RATHER THAN A HILL PROBLEM. IT IS ASSOCIATED IN LARGE PART WITH THE MORE INTENSIVELY USED FARMLANDS AROUND THE POPULATION CENTERS, WHERE GRAZING LANDS COME UNDER INCREASING PRESSURE AS AVERAGE FARM SIZE DIMINISHES, NUMBER OF DRAUGHT ANIMALS INCREASES, AND AS URBAN NEEDS FOR MEAT AND DAIRY PRODUCTS INCREASE. IT IS ALSO INTENSIFYING IN THE DRY ZONE, WHERE THE POPULATION GROWTH RATE OF SMALL RUMINANTS IS ACCELERATING UPWARD.

THE OPTIONS ARE:

1) TO IMPROVE AND UPGRADE CURRENT SOURCES OF FODDER
2) TO EXPAND GRAZING LANDS, GENERALLY WITH SOME CONCESSION TO DISTANCE, AND THE REALIZATION THAT ALTERNATIVE USES MUST BE FOREGONE.
3) TO LIMIT LIVESTOCK IN GIVEN LOCALITIES SO THAT CERTAIN KINDS OF PRODUCTION (EG. DAIRY CATTLE, SHEEP AND GOATS) WILL RECONSOLIDATE IN AREAS OF BEST COMPARATIVE ADVANTAGE

THE POTENTIAL IMPACT ON FORESTRY OF FOLLOWING THESE SEVERAL OPTIONS IS THREEFOLD. FIRST, IT RAISES THE QUESTION WHETHER ON-FARM AND VILLAGE TREE PRODUCTION CAN SERVE AS A VIABLE AND EFFECTIVE FODDER SOURCE. SECOND, IT RAISES THE QUESTION OF HOW TO COMPARE THE SOCIAL AND ECONOMIC RETURNS FROM GRAZING LAND, AS AGAINST CONVERSION TO FOREST LAND, IN AREAS WHERE LAND RESOURCES ARE LIMITED. THIRD, IT RAISES THE QUESTION OF HOW MUCH GRAZING

PRESSURE FORESTS, PARTICULARLY ON THE LOW HILLS ADJOINING THE VALLEYS, CAN ABSORB WITHOUT SUBSTANTIAL DETERIORATION OF THE DENSITY, QUALITY AND REPRODUCTIVE CAPACITY OF THE TREE CROP AND LOSS OF ITS MULTIPLE CONTRIBUTIONS.

D. SUFFICIENT WATER SUPPLIES

A FOURTH MAJOR NEED FOR AGRICULTURE IS AN ADEQUATE AND ASSURED WATER SUPPLY. IN BURMA, MONSOONAL RAINFALL VARIES MARKEDLY, NOT ONLY FROM PLACE TO PLACE AND MONTH TO MONTH, BUT ALSO FROM YEAR TO YEAR. CONSEQUENTLY, TECHNIQUES FOR MODULATING THE FLOW ARE IMPORTANT TO A STABLE AGRICULTURE. WATER STORAGE MEETS PART OF THE NEED EITHER IN THE FORM OF MAN-MADE IMPOUNDMENTS OR AS GROUNDWATER SUPPLIES. BUT, IN EITHER CASE, THE UTILITY OF THE STORAGE FACILITY IS THREATENED BY RAPID RUNOFF WHICH ANNUALLY POURS THOUSANDS OF TONS OF TOP SOIL INTO STREAMS AND WATER COURSES, THREATENS DAMS AND RESERVOIRS BY SILTATION, INHIBITS RECHARGE OF GROUNDWATER SUPPLIES, AND SERIOUSLY REDUCES DEPTH AND PRODUCTIVITY OF TOP SOILS ON FARM AND OTHER OPEN LANDS.

CONDITIONS ALONG THE IRRAWADDY TESTIFY TO THE CURRENT DETERIORATING SITUATION WITH RESPECT TO RUNOFF AND SOIL LOSSES. THE IRRAWADDY IS THE CENTER OF BURMA'S LARGEST RIVER SYSTEM AND DRAINS NEARLY 2/3 OF THE COUNTRY. ITS MAXIMUM DISCHARGE RATES ALREADY ARE CLOSE TO 60 TIMES HIGHER THAN ITS MINIMUM RATES. ITS SILT LOAD HAS BEEN ESTIMATED TO AVERAGE 191 MILLION TONS PER YEAR. THE FORESTS THAT COVER ITS UPPER CATCHMENTS ARE REMOTE ENOUGH THAT THEY HAVE NOT YET BEEN SERIOUSLY DEPLETED, UNLIKE THOSE ON LANDS FURTHER DOWNSTREAM. HOWEVER, THEY ARE FOR THE MOST PART UNPROTECTED AND THEIR DETERIORATION THROUGH TAUNGYA OPERATIONS ON STEEP, ERODABLE SLOPES INVITES EXTENSIVE AND SERIOUS URBAN AND AGRICULTURAL LOSSES THROUGH FLOODING SUCH AS ARE NOW EXPERIENCED IN BANGLADESH. 191 mill

BURMA'S BEST DEFENSE AGAINST RAPID, WIDESPREAD RUNOFF IS ACCEPTED TO BE ADEQUATE FOREST COVER, PARTICULARLY ON STEEPER SLOPES AND IN BUFFER ZONES ADJOINING CLEARED LANDS AND STREAMS. BY BLANKETING THE SOIL AND PROTECTING IT AGAINST IMPACT EROSION, SUCH COVER DEFLECTS AND ABSORBS INTENSE MONSOONAL RAINS AND ALLOWS THEM TO TRICKLE MORE EFFECTIVELY INTO THE SOIL. IT ALSO PROTECTS AGAINST DRYING WINDS AND, ACCORDING TO SOME, MAY HELP TO REGULATE RAINFALL PATTERNS SO THEY BECOME MORE EVENLY DISTRIBUTED.

E. EROSION PROTECTION

A FIFTH MAJOR NEED FOR BURMESE AGRICULTURE IS PROTECTION AGAINST SOIL EROSION. YET, THE EVIDENCE IS THAT EROSION ON BURMA'S AGRICULTURAL SOILS IS WIDESPREAD, OFTEN SEVERE, AND ONGOING. THE LOSSES HAVE THEIR GENESIS IN SEVEN CONDITIONS. FIRST, CERTAIN OF THE SOILS, BY VIRTUE OF THEIR STRUCTURE, ARE HIGHLY SUSCEPTIBLE TO IMPACT EROSION. SECOND, MUCH OF BURMA'S LAND AREA CONSISTS OF EXTREMELY STEEP HILLSIDES WHICH ERODE QUICKLY WHEN CLEARED. THIRD, DURING THE DRY SEASON PARTS OF CENTRAL BURMA ARE SUBJECT TO HARSH, HIGH VELOCITY WINDS, WHICH GENERATE MASSIVE SHEET EROSION, PARTICULARLY ON LANDS TILLED IN EXPECTATION OF THE MONSOONS. FOURTH, TORRENTIAL RAINS OF AS MUCH AS 350MM/24HRS GOUGE AND GULLY OPEN LANDS. FIFTH, EXTENSIVE FIRES, DEPLETE GROUND COVER AND PERMIT SOIL DESTRUCTION BY WIND AND RAIN. SIXTH, HEAVY GRAZING PRESSURES, WITH ATTENDANT SOIL COMPACTION AND DESTRUCTION OF LOW VEGETATION OPENS ADDITIONAL AREAS FOR EROSION. SEVENTH, MAJOR FLOODS GENERATED BY UPSTREAM CONDITIONS OCCASIONALLY THREATEN FERTILE ACREAGES IN THE LOWER VALLEYS. SO, LAND MANAGEMENT PRACTICES WHICH TEND TO ENCOURAGE EROSION ARE OFTEN COMBINED WITH NATURAL GEOGRAPHIC, SOIL AND METEOROLOGICAL CONDITIONS IN SUCH A WAY AS TO ACCELERATE SOIL LOSSES.

WHILE FARM PRACTICES IN SOME AREAS TEND TO LIMIT EROSION, THERE IS A TENDENCY TO IGNORE THE LINKAGES BETWEEN FOREST MANAGEMENT UPSTREAM AND AGRICULTURAL WELL BEING AND SECURITY DOWNSTREAM. SOME PRACTICES ON FARMS IN HILLY AREAS AND IN THE DRY ZONE ENCOURAGE EROSION AND THE AMELIORATING EFFECTS OF FOREST COVER ARE NOT UNDERSTOOD OR TAKEN ADVANTAGE OF. BURMA, IS LOSING A PART OF ITS SOIL HERITAGE EACH YEAR THAT WILL ONLY RENDER MORE DIFFICULT THE LIVES OF SUCCEEDING GENERATIONS.

III. SUMMARY AND PROBLEM IDENTIFICATION

AGRICULTURE IN BURMA CAN BE ARBITRARILY DIVIDED INTO HILL AND VALLEY SECTORS. THE HILLS ARE CHARACTERIZED BY ROVING AGRICULTURE, WITH EXCEPTIONS NEAR SCATTERED POPULATION CENTERS. THE VALLEYS ARE CHARACTERIZED BY SEDENTARY AGRICULTURE. IN THE HILLS, AGRICULTURAL CLEARINGS CONTINUE TO BE MADE IN A FOREST COVER WHICH IS RAPIDLY DETERIORATING AND DISAPPEARING. IN THE VALLEYS MOST OF THE FORESTS DISAPPEARED LONG AGO AND OPEN LANDS PREDOMINATE. FOREST LANDS ON THE HILLY PERIMETERS OF THE VALLEYS HAVE DETERIORATED DUE TO GRAZING AND FUELWOOD CUTTING. THEY ARE POORLY STOCKED.

A. VALLEY PROBLEMS THE SEDENTARY AGRICULTURE OF THE VALLEYS CURRENTLY FACES SEVERAL FORESTRY-RELATED PROBLEMS, SOME OF THEM QUITE SEVERE. A GROWING FUELWOOD SUPPLY DEFICIT IS THE MOST SERIOUS AND PRESSING PROBLEM. RISING WOOD AND CHARCOAL PRICES AFFECT NOT ONLY VALLEY FARMERS GENERALLY, AND PARTICULARLY THOSE IN THE DRY ZONE, BUT ALSO EXTREMELY LARGE NUMBERS OF THE URBAN POOR. THE ISSUE IS POLITICALLY SIGNIFICANT, AND CORRECTIVE, BROAD SCALE ACTION ALREADY IS OVERDUE.

VALLEY GRAZING LAND IS ALSO BECOMING SCARCE AND INSUFFICIENT. HERDS ARE INCREASING WITHOUT ADEQUATE PREPARATION OR PLANNING FOR ADJUSTMENT OF AGRICULTURAL PRACTICES TO MAINTAIN THEM. TWO SUCCESSIVE DROUGHT YEARS COULD PRECIPITATE AN EMERGENCY SITUATION FOR HERDERS. THE LIMITED ROLE OF FORESTS IN MAINTAINING LIVESTOCK WHILE BEING DEPENDED UPON TO MEET OTHER MULTIPLE-USE NEEDS HAS NOT BEEN THOUGHT THROUGH. INABILITY TO MEET LIVESTOCK FODDER REQUIREMENTS IS A GROWING PROBLEM SITUATION.

WATER CONSERVATION IS A PROBLEM. A SEDENTARY AGRICULTURE WITH GRADUALLY INCREASING FINANCIAL COMMITMENT ON MANY SMALL TRACTS OF LAND REQUIRES UNIFORMITY OF OPERATION TO ASSURE HIGH EFFICIENCY. LONGER OPERATING SEASONS ALREADY ARE BEING CALLED FOR. LARGE SEASONAL OR ANNUAL WATER FLUCTUATIONS DO NOT FIT EMERGING FARM NEEDS.

SOIL CONSERVATION ACTIVITY IS SPOTTY. CONSERVATION PRINCIPLES ARE GENERALLY FOLLOWED FOR MAJOR CROPS, PERHAPS BECAUSE THE PAYOFFS AND DANGERS HAVE BEEN MADE GENERALLY CLEAR. BUT GRAZING AND OTHER FARM PRACTICES ON SIDE HILLS ARE FREQUENTLY NOT CONSERVATIVE. CONTINUING FOREST REMOVALS ON LANDS ADJOINING VALLEY FARMS ENCOURAGE EROSION AND RAPID RUNOFF.

ALTHOUGH FARMLANDS FOR EXPANSION ARE SAID TO BE ADEQUATE, SLOW AND STEADY ENCROACHMENT INTO COMMERCIAL AND RESERVE FORESTS IMPLIES GREATER LAND DEVELOPMENT PRESSURES THAN ARE IMMEDIATELY APPARENT.

B. HILL PROBLEMS THE HILL FARMER'S PROBLEMS ARE NOT SO SHARPLY DEFINED AS ARE THOSE OF THE VALLEY FARMER. HIS IS A GRADUAL SUBSIDENCE INTO POVERTY DUE TO SOIL DEGRADATION AND INVASION OF WEED SPECIES CAUSED BY SHORTENING OF THE TAUNGYA LAND CLEARING CYCLE FROM 20 YEARS TO, IN SOME CASES, LESS THAN SIX YEARS. HE IS PRESIDING OVER AN AGRICULTURAL SYSTEM THAT INVITES SOIL EROSION, FOREST DEPLETION, AND DRAMATIC CHANGE IN SPECIES COMPOSITION AND HABITAT VALUE OF THE HILL FORESTS.

THE HILL FARMER IS PROBABLY LESS AWARE OF THE TOTAL IMPACT OF WHAT HE IS DOING THAN ARE THE VALLEY FARMERS, WHO TEND TO BE BETTER EDUCATED, MORE SOCIALLY ORIENTED, AND WHO CANNOT WALK AWAY FROM THEIR ACTIONS LIKE HE DOES. HE SIMPLY MOVES ON WHEN RETURNS SINK TOO LOW. YET, THIS TOTAL IMPACT IS IMMENSE, AND HAS NOW BEEN MEASURED IN TERMS OF FOREST CLEARING APPROACHING, OR EXCEEDING 500,000 HECTARES PER YEAR.

THE HILL FARMER'S PROBLEMS DO NOT SEEM TO BE TECHNICAL ONES LIKE THOSE OF THE VALLEY FARMERS. THEY ARE SOCIAL. THE BASIC QUESTION IS HOW TO TURN THE SHIFTING CULTIVATOR TO OTHER FORMS OF USEFUL ENTERPRISE. THE OPTION OF CONTINUING TO CLEAR, PLANT AND MOVE ON, IN THE TIME-HONORED WAY IS NO LONGER VIABLE EITHER FOR HIM OR FOR THOSE DOWNSTREAM WHO LOOK TO THE HILLS FOR PROTECTION.

LOOKED AT IN PERSPECTIVE, AGRICULTURE'S FIVE NEEDS CREATE A CONFLICT. THE NEEDS FOR CROPLAND, FOR FUELWOOD AND FOR GRAZING LAND ALL TEND TOWARD FOREST DEPLETION, WHILE PRESSURES FOR SOIL AND WATER CONSERVATION TEND TOWARD FOREST MANAGEMENT AND REPLACEMENT. DEPLETION IS " WINNING" BECAUSE SHORT TERM PERSONAL NEEDS FOR FOOD AND FUEL ARE EASIER TO VISUALIZE AND TO MEASURE THAN THE LONG TERM, WIDESPREAD EFFECTS OF SOIL EROSION, FLOODS AND DROUGHT. BUT EVEN AMONG CROPLAND, FUEL AND GRAZING NEEDS, THERE IS FURTHER COMPETITION AND CONFLICT. RIGHT NOW, FUELWOOD SHORTAGES ARE POTENTIALLY THE MOST EXPLOSIVE ISSUE, AND FOREST PRODUCTION IS THE ONLY LOW COST SOLUTION AVAILABLE. FOR GRAZING AND CROPLAND THERE ARE OTHER OPTIONS. MEANWHILE, SOIL AND WATER CONSERVATION ARE BECOMING MORE IMPORTANT TO PEOPLE WHOSE FORTUNES ARE INCREASINGLY TIED TO MINOR FLUCTUATIONS IN THE PRODUCTIVITY OF SMALL TRACTS OF LAND.

IV. GOVERNMENT RESPONSES

THE GOVERNMENT OF BURMA, AWARE OF ITS CURRENT (FORESTRY) PROBLEMS AND RESPONSIBILITIES, HAS IDENTIFIED ITS MAIN OBJECTIVES AS FOLLOWS:

1. MAXIMISE TEAK EXPORT REVENUES
2. SATISFY DOMESTIC DEMAND FOR WOOD PRODUCTS
3. SUBSTITUTE OTHER HARDWOODS FOR TEAK IN THE DOMESTIC MARKET
4. SATISFY URBAN AND RURAL DEMAND FOR FUELWOOD
5. DEVELOP AND MAINTAIN THE FOREST RESOURCE

AMONG THESE GOALS, ITEMS 5 AND 6 HAVE DIRECT IMPACT ON AGRICULTURE. AS NOTED EARLIER, A LOCAL SUPPLY PLANTATION PROJECT HAS BEEN PUT FORTH TO REPLACE THE DWINDLING RESOURCE BASE IN SELECTED AREAS, BUT AT PRESENT HAS NOT BEEN SPONSORED. ALSO, THE FORESTRY III PROJECT PROPOSES EXTENSIVE TEAK, COMMERCIAL HARDWOOD AND FUELWOOD-PLANTATIONS, BUT IS STILL PENDING.

MEANWHILE, THE GOVERMENT IS PROCEEDING ON ITS OWN, THROUGH ITS FOREST DEPARTMENT, WITH A 4-PART PLANTING PROGRAM. IT CONSISTS OF COMMERCIAL PLANTINGS OF HIGH VALUE SPECIES SUCH AS TEAK AND PADAUK; INDUSTRIAL PLANTINGS SUCH AS FOR MATCHWOOD AND PAPER PULP; CATCHMENT PLANTINGS FOR WATER PROTECTION PURPOSES NEAR DAMS AND IN CRITICAL WATERSHED AREAS; AND VILLAGE SUPPLY PLANTINGS. THIS LAST CATEGORY HAS TWO FORMS. SOME PLANTINGS ARE DONE BY THE FOREST DEPARTMENT IN RESERVE FOREST AREAS NEAR AND ACCESSIBLE TO VILLAGES. OTHERS (SO CALLED "SELF-HELP" PLANTINGS) ARE CARRIED OUT BY VILLAGERS ON VILLAGE-OWNED LAND. THE FOREST DEPARTMENT PROVIDES THE SEEDLINGS AND TECHNICAL HELP; THE VILLAGE PROVIDES THE LABOR AND SUBSEQUENT PROTECTION. IN ADDITION TO THE ABOVE, THE FOREST DEPARTMENT PROVIDES ABOUT 3 MILLION SEEDLINGS PER YEAR TO SCHOOLS, HOSPITALS, ARMY ETC. THESE PLANTINGS ARE RATED ABOUT 50% SUCCESSFUL.

TO HELP MEET RANGOON'S FUELWOOD NEEDS (I.E. A COMMERCIAL SUPPLY OF ABOUT 600,000 TONS OF FUELWOOD AND CHARCOAL PER YEAR) THE FOREST DEPARTMENT IS INITIATING A LARGE-SCALE PLANTING PROGRAM ON MAJIR RESERVE FOREST ABOUT 60 MILES FROM RANGOON. IDEALLY, SOME 32,000 ACRES WILL BE PLANTED ANNUALLY FOR FIVE YEARS. CURRENTLY, PLANTING IS AT THE RATE OF ABOUT 5000 A PER YEAR, AND THERE ARE LABOR AND EQUIPMENT CONSTRAINTS.

ALTHOUGH OTHER FOREST REBUILDING AND CONSERVATION ACTIVITIES ARE ENVISIONED, THE FOREST DEPARTMENT DOES NOT HAVE THE TRAINED PERSONNEL, SPECIALIZED FACILITIES OR FINANCIAL RESOURCES TO PURSUE THEM ON ITS OWN.

V. RECOMMENDATIONS

GIVEN THE CURRENT FORESTRY SITUATION IN BURMA, THREE GENERAL LINES OF ACTION MERIT CONSIDERATION:

1. ENCOURAGE REFORESTATION BY SEDENTARY AGRICULTURE
2. DISCOURAGE DEFORESTATION BY ROVING AGRICULTURE
3. SUPPORT INTEGRATED RESOURCE MANAGEMENT BY GOVERNMENT

SPECIFIC, CURRENT RECOMMENDATIONS IN SUPPORT OF THESE ACTION AREAS ARE AS FOLLOWS.

RECOMMENDATION 1. INITIATE ON FARM PLANTING OF TREES AS A MULTIPLE-USE CROP

JUSTIFICATION IT HAS LONG BEEN KNOWN THAT FAST-GROWING TREES CAN MAKE MULTIPLE CONTRIBUTIONS ON THE FARM. IF WISELY CHOSEN, THEY CAN PROVIDE FOOD, FUEL AND FODDER, REDUCE SOIL EROSION, CONTRIBUTE TO SOIL FERTILITY AND OTHERWISE ENHANCE CROP YIELDS. BURMA'S FARMERS AND VILLAGE COUNCILS DO NOT GENERALLY ENDORSE THIS NOTION. BUT IF IT COULD BE PROVED TO THEM, SEVERAL MAJOR PAYOFFS WOULD FOLLOW. FIRST, THE ACCEPTANCE OF ON-FARM TREE PLANTING MOVES IN THE DIRECTION OF MORE INTENSIVE USE OF SMALLER ACREAGES, WHICH IS THE INEVITABLE FUTURE DIRECTION FOR ALL OF ASIA. SECOND, IT REDUCES THE INTENSITY OF THE CONFLICT BETWEEN THE SHORT TERM DESIRE FOR CROPLAND, GRAZING LAND AND FUELWOOD, AND THE LONG TERM DESIRE FOR WATER AND SOIL CONSERVATION. THIRD, IT INTRODUCES THE FIELD OF AGROFORESTRY AS A VIABLE AREA FOR CONTINUED RESEARCH, INVESTIGATION AND TRAINING. FOURTH, THE GOAL CAN BE REACHED BY CLOSE COOPERATION BETWEEN THE AGRICULTURAL CORPORATION AND THE FOREST DEPARTMENT AND CAN SERVE TO STRENGTHEN THE OPERATING BOND BETWEEN THEM. FIFTH, ON-FARM PLANTING CAN PROVIDE THE ADVANTAGE OF SEVERAL, SIMULTANEOUS RETURNS TO THE FARMER. A SINGLE PLANTING MAY YIELD FORAGE, FUELWOOD, FRUIT OR OTHER PRODUCTS

SUITABLE FOR COTTAGE INDUSTRY. SIXTH, AND IMPORTANTLY, ONCE THE FARMER IS CONVINCED THAT THE PLANTING USUALLY MAKES HIM BETTER OFF, AND NEVER WORSE OFF, THERE IS CREATED IN HIS MIND THE BEGINNINGS OF A CONSERVATION ETHIC - THAT IT IS REWARDING TO ESTABLISH TREES AS WELL AS TO HARVEST THEM, AND THAT THEIR PERPETUATION AND REPLACEMENT CARRIES WITH IT LONG TERM ADVANTAGES THAT SHOULD NOT BE OVERLOOKED OR UNDERESTIMATED. THERE SEEMS TO BE NO SUCH ETHIC AMONG BURMA'S AGRICULTURAL POPULATION TODAY. AT BEST, IT IS NOT WELL ENTRENCHED. YET, WITHOUT IT, BURMA STANDS LITTLE CHANCE OF PRESERVING, UPGRADING AND EXPANDING HER RENEWABLE NATURAL RESOURCE BASE AS A MEANS OF FUTURE SUPPORT.

ON-FARM TREE PLANTING CAN BE FITTED INTO THE AID'S FARM CROPPING PROGRAM BECAUSE IT CAN RAISE THE EFFICIENCY OF THE CASH-CROPPING ENTERPRISE IN AT LEAST FOUR MAJOR WAYS.

1. BY REDUCING THE TIME SPENT AWAY FROM THE FARM IN SEARCH OF FUELWOOD AND FORAGE, IT CAN SAVE TIME FOR CROP ORIENTED ACTIVITIES.

2. BY THE SAME TOKEN, IT SAVES SIGNIFICANT AMOUNTS OF HUMAN AND ANIMAL ENERGY FOR ON-FARM WORK.

3. IT CAN HELP KEEP SOIL FERTILITY HIGH BY KEEPING MANURE ON THE FARM, BY REDUCING WIND AND WATER EROSION, AND (WITH SOME TREE SPECIES) BY INTRODUCING NITROGEN-FIXING AGENTS INTO THE SOIL.

4. IT CAN CUT SOIL MOISTURE LOSSES BY PROVIDING WINDBREAK AND LIGHT SHADE AS NEEDED.

MOREOVER, A PROGRAM FOR THE ESTABLISHMENT OF EFFECTIVE, ON-FARM TREE PLANTING CAN MAKE GOOD USE OF THE INSTITUTIONS THAT HAVE ALREADY BEEN ESTABLISHED AND PUT IN PLACE IN SUPPORT OF THE OILSEED PROGRAM. INCLUDED ARE THE WIDELY DISPERSED NETWORK OF EXPERIMENTAL AND RESEARCH FARMS, SEED PRODUCTION STATIONS, A VIGOROUS EXTENSION SERVICE AND THE AGRICULTURAL RESEARCH INSTITUTE AT YEZIN. COUNTERPART ORGANIZATIONS WITHIN THE FOREST DEPARTMENT HAVE ALREADY CARRIED OUT MUCH OF THE PRELIMINARY EXPERIMENTATION SUPPORTIVE OF REALISTIC EXHIBITS ON DEMONSTRATION FARMS, THAT CAN SERVE TO LAUNCH SUCH A PROGRAM QUICKLY AND EXTEND IT TO THE LANDS OF FORWARD-LOOKING PRIVATE FARMERS.

RESEARCH, EXPERIMENTATION AND EXTENSION WORK IN VARIOUS REGIONS OF BURMA WILL ALL BE REQUIRED TO MAKE THE SMALL SCALE TESTS, ECONOMIC EVALUATIONS AND COMMERCIAL SCALE TRIALS NEEDED TO ESTABLISH THE VALIDITY OF THE APPROACH UNDER WIDELY VARYING CONDITIONS, AND TO GET ACCEPTED TECHNIQUES INTO PRACTICE. BECAUSE THE FOREST DEPARTMENT AND THE AGRICULTURE CORPORATION ALREADY COMBINE A WEALTH OF EXPERIENCE ALONG THESE LINES, ESTIMATED TIME TO GET PROVEN RESULTS ON DEMONSTRATION FARMS THROUGHOUT BURMA SHOULD TAKE NO MORE THAN 5 TO 8 YEARS.

RECOMMENDATION 2. SUPPORT LARGE-SCALE GOVERNMENT FUELWOOD PLANTATIONS FOR MAJOR POPULATION CENTERS AND ENVIRONS

JUSTIFICATION: DEMAND FOR FUELWOOD IS RELATIVELY INELASTIC. THERE ARE NO LOW COST ALTERNATIVES, AND PEOPLE MUST COOK THEIR FOOD. PRICES ARE RISING PRIMARILY BECAUSE DEPLETION OF NEARBY MAJOR SUPPLY SOURCES RAISES TRANSPORT COSTS. IN RANGOON, THE ANSWER HAS BEEN TO EXPLOIT THE MANGROVE FORESTS TO THE SOUTH. THIS EXPLOITATION HAS BEEN, OR PROMISES TO BE, DAMAGING TO FISHERIES

DEVELOPMENT, LAND CONSOLIDATION, TANNIN PRODUCTION AND OTHER MAJOR CONSERVATION CONTRIBUTIONS THAT THE MANGROVES MAKE. THE PROTECTION OF THE SPECIES IS CURRENTLY OF WORLD-WIDE CONCERN. AT CURRENT RATES OF DEPLETION, BURMA'S ONCE RICH MANGROVE FORESTS WILL SOON BE GONE. LARGE SCALE FUELWOOD PLANTATIONS FOR RANGOON, BY TAKING THE CUTTING PRESSURES OFF THE MANGROVES WILL HAVE MADE AN IMPORTANT CONTRIBUTION TO CONSERVATION OF ONE OF BURMA'S GREAT SPECIAL RESOURCES.

SECOND, THE FUELWOOD PRICE RISE IS AN ISSUE OF POLITICAL SIGNIFICANCE. IF IT CONTINUES AT CURRENT RATES, THE COST OF FUEL WILL BECOME AN INCREASINGLY LARGER PART OF THE COST OF LIVING, AND WILL EXERT PARTICULARLY HARSH PRESSURES UPON THE URBAN, SUBURBAN AND NEARBY RURAL POOR. THE GOVERNMENT DOES NOT WANT ITS PEOPLE TO BE CONFRONTED WITH PRICES FOR BASIC COMMODITIES THEY CANNOT AFFORD. AMELIORATIVE ACTIVE IS NEEDED.

THIRD, THE SCALE OF THE ENTERPRISE REQUIRED IS IMMENSE, AND THE GOVERNMENT DOES NOT HAVE THE RESOURCES TO MEET IT. THE LAND IS AVAILABLE, BUT THE LABOR AND CAPITAL ARE NOT. A BAIL-OUT, MINIMUM PROGRAM ESTIMATED AT 30,000 ACRES PLANTED PER YEAR FOR FIVE YEARS IS NOT FEASIBLE WITHOUT ADDED SUPPORT.

FOURTH, THE GOVERNMENT HAS DEVELOPED A SENSIBLE PLAN FOR ACHIEVEMENT AND IS GOING AHEAD WITH IT ON A MODEST SCALE. THE PROCEDURES HAVE BEEN ESTABLISHED AND TESTED, AND THE COMMITMENT IS THERE. AT LEAST TWO PROJECTS THAT HAVE BEEN PROPOSED CONTAIN ELEMENTS SUPPORTIVE OF THIS ENTERPRISE, BUT NEITHER OF THEM HAS BEEN ADOPTED.

THE NEED IS CLEAR. THERE APPEAR TO BE MAJOR PAYOFFS. ACTION IS OVERDUE. PROCEDURES HAVE BEEN PARTIALLY THOUGHT THROUGH. OUTSIDE SUPPORT WOULD APPEAR TO BE THE ONLY TIMELY SOLUTION.

RECOMMENDATION 3. SUPPORT SERIOUS INVESTIGATIONS OF ROVING AGRICULTURE AND HOW TO CURB IT.

JUSTIFICATION: ROVING AGRICULTURE HAS OUTLIVED ITS USEFULNESS IN MUCH OF BURMA. THE HILL REGIONS OF THE UPPER HALF OF BURMA APPEAR TO BE UNDER EXTREME AND DAMAGING PRESSURE FROM TAUNGYA OPERATIONS. FORTHCOMING FOREST INVENTORY DATA WILL CONFIRM THE RAPID, WIDESPREAD AND ONGOING DEPLETION OF FORESTS IN THE ARAKAN, CHIN, KACHIN AND SHAN STATES. THE POPULATIONS ARE TOO BIG NOW, AND THE RECYCLING OF PREVIOUSLY CLEARED LANDS TOO SHORT (IN MANY AREAS LESS THAN SIX YEARS) FOR THE LANDS TO SUPPORT THEM. PERMANENT REDUCTION OF THE FOREST, EROSION, AND DIMINISHED WATERSHED PROTECTION AND LOCAL POVERTY ARE MORE WIDESPREAD ALREADY THAN HAD BEEN ANTICIPATED.

THE NEED IS TO WEAN SHIFTING CULTIVATORS INTO OTHER FORMS OF ENTERPRISE, OR AT LEAST TO EXERT CONTROLS OVER THEIR ACTIVITIES THAT WILL HELP TO REDUCE FOREST DEPLETION AND OTHER FAR-REACHING RESOURCE LOSSES. THIS IS NOT EASILY DONE, BECAUSE OF SEVERAL BUILT-IN SOCIAL CONSTRAINTS. YET THESE TENS OF THOUSANDS OF FARMERS AND THEIR FAMILIES REPRESENT A SIGNIFICANT RESOURCE FOR BURMA, THE PRODUCTIVE CAPABILITIES OF WHICH COULD BE TURNED TO FOREST REPLENISHMENT, SOIL AND WATER CONSERVATION WORKS, SPECIALIZED FORMS OF AGRICULTURE AND OTHER LAND MANAGEMENT ACTIVITIES.

AN IMPORTANT QUESTION SEEMS TO BE WHO, IN BURMA, HAS A DIRECT RESPONSIBLITY FOR WHAT IS HAPPENING IN THE HILLS, OR WHAT TO DO ABOUT IT? AT A TIME WHEN LOCAL RESOURCES ARE STRAINED, LARGER PROBLEMS IN THE MORE HIGHLY COMMERCIALIZED VALLEY AREAS TAKE PRECEDENCE. BUT INCREASING RUNOFF, COUPLED WITH HIGHER FLOOD DANGERS, INCREASING SILT LOADS IN RIVERS AND STREAMS AND INCREASING POPULATIONS OF POOR PEOPLE IN THE HILLS CANNOT BE SHRUGGED OFF. QUICK SOLUTIONS OF THE PAST HAVE NEVER COME TO MUCH. WHAT IS NEEDED AT THIS STAGE IS IN-DEPTH EVALUATION OF WHAT IS HAPPENING AND THE RATE AT WHICH CHANGES ARE OCCURRING, AND CAREFUL EVALUATION OF VIABLE ALTERNATIVES SO THAT A PROGRESSIVE PROGRAM FOR HANDLING THE SITUATION ON A WIDE SCALE CAN BE DEVISED.

RECOMMENDATION 4. ENCOURAGE DIALOGUE AT THE HIGHEST LEVELS OF GOVERNMENT (I.E. CABINET LEVEL) LEADING TO FORMULATION OF A COMPREHENSIVE LAND USE PLAN FOR BURMA.

JUSTIFICATION: ONE OF BURMA'S RICHEST HERITAGES IS ITS RESOURCE BASE. AN EARLY STEP WAS TO DIVIDE THE RESOURCE INTO MAJOR COMPONENTS (LIKE FISHERIES, AGRICULTURE, FORESTRY, WILDLIFE, MINES) AND TO SEEK HIGH LEVELS OF EFFICIENCY IN THE USE OF EACH COMPONENT. SOONER OR LATER THEIR SEPARATE LINES OF DEVELOPMENT CAME IN CONFLICT. SO THE IMPACTS OF AGRICULTURAL PRACTICE ARE

FELT BY BURMA'S WILDLIFE, FISHERIES AND FORESTS, AND VICE VERSA. BECAUSE OF THESE CONFLICTS, THE SEPARATENESS AND INDIVIDUAL GOAL STRUCTURES OF THE ORGANIZATIONS ORIGINALLY ESTABLISHED BY GOVERNMENT TO SUPERINTEND THE UTILIZATION AND MAINTENANCE OF ITS RESOURCES, EVENTUALLY HAVE COME TO BLOCK THE ATTAINMENT OF HIGHER LEVELS OF EFFICIENCY IN RESOURCE USE. WHAT IS NEEDED AT THIS STAGE IS A COMPREHENSIVE PLAN FOR THE USE OF THE LANDS AND RESOURCES WHICH RECOGNIZES AND DEALS NOT ONLY WITH THE INTERCONNECTIONS BETWEEN RESOURCES BUT ALSO WITH THOSE BETWEEN AGENCIES, AND WHICH LEADS TOWARD A REASSIGNMENT OF RESPONSIBILITIES AND RECONCILIATION OF CONFLICTING GOALS. BURMA HAS MUCH TO GAIN FROM THIS KIND OF PLANNING NOW, WHEN HIGHER LEVELS OF OPERATING EFFICIENCY, BOTH TECHNICAL AND MANAGERIAL, CAN HELP INCREASE CURRENT PROFITS, REDUCE RESOURCE WASTE AND PRESERVE BURMA'S RESOURCE HERITAGE FOR THE FUTURE.

SUCH ACTION MAY NOT HAVE APPEAL AS AN IMMEDIATE OR HELPFUL WAY OF INCREASING FOREIGN EXCHANGE, RAISING LIVING STANDARDS, OR SUPPORTING A SHIFT FROM STRONG DEPENDENCE ON AGRICULTURE TO A MORE DIVERSIFIED ECONOMY. BUT WHAT IT CAN DO IS TO DEMONSTRATE TO THE BURMESE PEOPLE, AND TO THE WORLD, THE GOVERNMENT'S DESIRE TO MANAGE ITS RESOURCES WISELY AND WELL, BRING ABOUT A RESTATEMENT OF THE RULES UNDER WHICH THOSE RESOURCES ARE TO BE MANAGED AND AN ORGANIZATIONAL STRUCTURE AND GOALS FITTED TO MEET EMERGING NEEDS WITH THE GREATEST OF EFFICIENCY.

RECOMMENDATION 5. INCLUDE NATURAL RESOURCE CONSERVATION WITHIN THE AID BURMA PROGRAM

JUSTIFICATION: BURMA'S NATURAL RESOURCES ARE IMMENSE, BUT SUBJECT TO RAPID DEPLETION. INCREASING NUMBERS OF PROJECTS ARE BEING PROPOSED IN SUPPORT OF PRESERVATION AND RENEWAL ACTIVITIES, BUT AID IS IN A POOR POSITION TO RESPOND TO RECOGNIZED NEEDS BECAUSE ITS LOCAL PROGRAM DOES NOT REFLECT FULLY THE GENERAL AID POLICIES WHICH SUPPORT RESOURCE MANAGEMENT, CONSERVATION PRACTICES, GENETIC PRESERVATION AND THE LIKE.

SPECIAL REASONS FOR DIRECTING EXTRA ATTENTION TO BURMA'S NATURAL RESOURCES INCLUDE THEIR LARGE CURRENT CONTRIBUTION TO THE ECONOMY (TEAK, FOR EXAMPLE, IS THE NATION'S SECOND LARGEST SOURCE OF FOREIGN EXCHANGE, AND FISHERIES ARE PROMISING VERY RAPID INCOME GROWTH); THEIR UNIQUENESS AND GREAT DIVERSITY RELATIVE TO THE RESOURCES OF OTHER ASIAN COUNTRIES (ESPECIALLY WILDLIFE AND FOREST TYPES IN SELECTED AREAS); AND THE RESOURCE INTERLINKAGES WHICH SERVE TO MAKE THE PROSPECTS FOR BURMA'S STABLE CORE, ITS VALLEY AGRICULTURE, HEAVILY AND INCREASINGLY DEPENDENT ON WHAT HAPPENS TO THE RESOURCE BASE IN THE SURROUNDING HILLS.

IN MANY NATIONS, THERE IS NOTHING LEFT BUT TO REPLACE A VANISHED HERITAGE. IN BURMA, THE PROSPECTS ARE LESS GRIM. THE CHANCE TO PROTECT, PRESERVE AND CONSERVE IS STILL AVAILABLE. THOUGH VARIOUS DONORS ARE BEGINNING TO RECOGNIZE THIS OPTION, IT DOES NOT CURRENTLY HAVE THEIR SUPPORT BECAUSE GOVERNMENT SYMPATHIES ARE NOT TUNED TO THIS TYPE OF ACTIVITY. BUT LOCAL REALIZATION OF THE NEED, AND THE EXTREMITY OF THAT NEED, EVENTUALLY WILL RAISE THE QUESTION AS TO WHO IS READY TO SUPPORT REMEDIAL ACTION. AID NEEDS TO CONSIDER NOW WHETHER NATURAL RESOURCE CONSERVATION IS TO BE CONSIDERED AS IMPORTANT IN BURMA AS IT HAS BEEN SHOWN TO BE ELSEWHERE AMONG THE LDCS.

APPENDIX A.

FORESTRY-ORIENTED PROJECTS OF RECENT YEARS

W.B. FORESTRY I PROJECT

SPONSOR: WORLD BANK EXECUTING AGENCY: TIMBER CORPORATION
APPROVAL: 1974 COMPLETED 1982 TOTAL PROJECT COST $42.6 MILLION U.S.

DESIGNED TO INCREASE THE EXTRACTION RATE FOR TEAK AND OTHER HARDWOODS IN A 5 MILLION ACRE AREA (SEE MAP). THIS AREA GIVEN PRIORITY BECAUSE IT CONTAINED BOTH A HEAVY BACKLOG OF GIRDLED TEAK AND EXTENSIVE STANDS OF ESPECIALLY VALUABLE "BLACK STRIPE" TEAK AND WAS RELATIVELY FREE OF INSURGENT ACTIVITY. A SECOND OBJECTIVE WAS TO INCREASE THE MILLING CAPACITY AND EFFICIENCY OF SELECTED SAWMILLS IN THE AREA. THE THIRD OBJECTIVE WAS TO MAKE A COMPREHENSIVE STUDY OF THE FORESTRY SECTOR SO AS TO PROVIDE A FRAMEWORK FOR FUTURE DEVELOPMENT WORK AND TO IDENTIFY SPECIFIC INVESTMENT OPPORTUNITIES.

THESE SEVERAL OBJECTIVES WERE TO BE MET BY PURCHASE OF NEW ROAD CONSTRUCTION AND TIMBER EXTRACTION EQUIPMENT AND SPARES; STREAM-LINING AND ACCELERATION OF ROADING AND HARVESTING PROGRAMS; SAWMILL REHABILITATION AND NEW CONSTRUCTION; IMPROVED TECHNIQUES TO REDUCE IN-TRANSIT LOG LOSSES; BETTER MANAGEMENT PROCEDURES, INCLUDING IMPROVED ACCOUNTING, AUDITING, COST ACCOUNTING AND MANAGEMENT INFORMATION SYSTEMS; AND A CONSULTANT STUDY OF FORESTRY CONDITIONS (IN L3 VOLUMES).

W.B. FORESTRY II PROJECT

SPONSOR: WORLD BANK EXECUTING AGENCY: TIMBER CORPORATION, FORESTRY DEPARTMENT
APPROVAL: 1979 COMPLETED TOTAL PROJ. COST $86.4 MILLION U.S.

INVOLVED AN AREA OF THE EAST PEGU YOMA ADJOINING THE FORESTRY I PROJECT (SEE MAP). OBJECTIVES SIMILAR TO THOSE OF FORESTRY PROJECT I, BUT PLACED MORE STRESS ON IMPROVING MECHANICAL MAINTENANCE CAPACITY, ON UPGRADING OF RAIL AS WELL AS ROAD TRANSPORT, ON TIMBER MARKETING AND ON OVERSEAS TRAINING FOR MANAGERS. A NEW DIMENSION OF ACTIVITY WAS TO BE ESTABLISHMENT OF EXTENSIVE COMMERCIAL TEAK PLANTATIONS (30,000 A). AND INVESTMENT IN LARGE-SCALE TRIAL PLANTATIONS TO SELECT SUITABLE FAST GROWING HARDWOOD SPECIES FOR INDUSTRIAL USE. THIS ACTIVITY REFLECTED CONCERN OVER GRADUAL FOREST DEPLETION, AND THE NEED TO INSURE PERPETUATION OF INDUSTRIAL SUPPLIES THROUGH COMPENSATORY PLANTING.

ADB FORESTRY PROJECT I AND II

SPONSOR: ASIAN DEVELOPMENT BANK EXECUTING AGENCY: TIMBER CORPORATION
APPROVAL: COMPLETED: TOTAL PROJ. COST ___ MILLION U.S.

THESE TWO PROJECTS EXTENDED THE IMPROVED HARVESTING, EXTRACTION, TRANSPORTATION AND MILLING PROCEDURES INTO MORE NORTHERN SECTIONS OF BURMA (SEE MAP) WITHOUT INTRODUCING NEW OBJECTIVES.

IDA WOOD INDUSTRY I PROJECT

SPONSOR: WORLD BANK EXECUTING AGENCY: TIMBER CORPORATION

APPROVAL: 1981 COMPLETED: ___ TOTAL PROJ.COST ___ MILLION US|

DESIGNED PRIMARILY TO INCREASE THE VALUE ADDED OF FOREST PRODUCTS. IT AIMED TO MODERNIZE AND REHABILITATE 2 TEAK SAWMILLS AND 2 PLYWOOD MILLS, AND TO INCREASE OUTPUT OF FURNITURE, TEAK VENEER AND FLOORING PRODUCTS.

IDA WOOD INDUSTRY II PROJECT

SPONSOR: WORLD BANK EXECUTING AGENCY: TIMBER CORPORATION

APPROVAL: (PENDING) COMPLETED: ___ TOTAL PROJ COST EST $60 M

DESIGNED TO IMPROVE THE EFFICIENCY AND QUALITY OF TEAK PRODUCTION, INCREASE THE SUPPLY OF HARDWOOD SAWN TIMBER AND PANEL PRODUCTS FOR THE LOCAL MARKET, INTRODUCE BLOCK BOARD PRODUCTION INTO BURMA, AND TO TRAIN TECHNICAL PERSONNEL. IT WILL REHABILITATE AND RECONSTRUCT TWO TEAK SAWMILLS AND PUT TWO NEW, MOBILE HARDWOOD MILLS INTO PRODUCTION, CONSTRUCT A NEW PANEL PRODUCTS MILL AND PROVIDE TRAINING AND TECHNICAL ASSISTANCE FOR PERSONNEL.

W.B. FORESTRY III PROJECT

SPONSOR: WORLD BANK EXECUTING AGENCY: TIMBER CORPORATION

FOREST DEPARTMENT

APPROVAL: (PENDING) COMPLETED: TOTAL PROJ COST $80 M EST.

BUILDS ON EARLIER PROJECTS TO INCREASE WOOD-USING INDUSTRIAL PRODUCTION EFFICIENCY, INCREASE VALUE ADDED BY MANUFACTURE, UTILIZE WOOD RESIDUES AND WIDER RANGE OF TIMBER SPECIES, IMPROVE TIMBER CORPORATION MARKETING PROCEDURES, IMPROVE REPAIR AND MAINTENANCE FACILITIES AND METHODS FOR EXTRACTION OPERATIONS, AND TO HELP ESTABLISH TEAK, COMMERCIAL HARDWOOD AND FUELWOOD PLANTATIONS, AND TO INITIATE PROGRAMS FOR DEVELOPMENT OF SOCIAL FORESTRY IN RURAL AREAS. ALSO, STRENGTHENING OF CARTOGRAPHY AND PHOTO-INTERPRETATION SECTIONS OF FD ARE CONTEMPLATED AS WELL AS RESEARCH ON WILD AND DOMESTIC ELEPHANTS.

IDA LOCAL SUPPLY FUELWOOD PLANTATIONS PROJECT

SPONSOR: WORLD BANK EXECUTING AGENCY: FOREST DEPARTMENT
APPROVAL: (PENDING) TOTAL PROJ COST $75 MILLION U.S.
[redacted]

DEVELOPED BY THE GOVERNMENT OF BURMA WITH ASSISTANCE FROM FAO/CP. THIS PROJECT RESPONDS TO LOCAL DEFICITS OF HARDWOOD AND SMALL TIMBER. IT IS DESIGNED TO SUPPLY LOCAL NEEDS FOR FIREWOOD, POSTS, POLES AND CONSTRUCTION MATERIALS, AND TO CONTROL EXPLOITATION OF FOREST RESOURCES. IT PROVIDES FOR CREATION OF EXTENSIVE ACREAGES OF FAST-GROWING HARDWOOD PLANTATIONS AND THE INSTITUTIONAL STRUCTURES NEEDED TO ESTABLISH AND MANAGE THEM; MAINTENANCE AND PROTECTION OF EXISTING PLANTATIONS; DISTRIBUTION OF LOW COST SEEDLINGS TO PEOPLE IN RURAL AREAS FOR HOME-PLANTING, SUPPORTING FORESTRY EXTENSION SERVICES, AND STRENGTHENING OF STAFF AND EQUIPMENT FOR MANAGING AND PROTECTING MANGROVE AREAS. THE PROJECT MAY ALSO INCLUDE ELEMENTS OF RESEARCH, TRAINING OF SUB-PROFESSIONAL FORESTRY STAFF AND STRENGTHENING OF FORESTRY EXTENSION EFFORTS.

IN CONTRAST TO PROJECTS MOUNTED EARLIER, ITS PRIMARY IMPACT IS ON THE FORESTRY DEPARTMENT RATHER THAN ON THE TIMBER CORPORATION, AND IS DIRECTED AT FOREST REPLACEMENT AND MANAGEMENT RATHER THAN ON ITS EXPLOITATION. IT IS A DIRECT RESPONSE TO A PERCEIVED LACK OF MEANINGFUL PROGRAMS TO AUGMENT FUELWOOD AND OTHER WOOD SUPPLIES TO URBAN CENTERS AND RURAL AREAS FACING SERIOUS LOCAL FOREST DEPLETION.

FAO/UNDP NATIONAL FOREST SURVEY AND INVENTORY PROJECT

SPONSOR: UNDP EXECUTING AGENCY: FOREST DEPARTMENT
APPROVAL: 1981 COMPLETED 1986 (EST). TOTAL PROJ COST $7.0 M U.S.

CONCEIVED TO HELP OVERCOME INSUFFICIENT KNOWLEDGE OF THE RESOURCE. PRESENT FORESTRY MANAGEMENT PLANS AND ACTIVITIES ARE BASED ON OUTDATED INFORMATION. THIS PROJECT HELPS GENERATE TRAINED PERSONNEL, AND INTRODUCES MODERN EQUIPMENT AND PROCEDURES FOR COMPLETE INVENTORY BASED ON AERIAL PHOTOGRAPHY WITH GROUND CONTROLS.

FAO/UNDP ESTABLISHMENT OF A FOREST RESEARCH INSTITUTE

SPONSOR: FAO/UNDP EXECUTING AGENCY: FOREST DEPARTMENT/FAO
APPROVAL: 1974 COMPLETED: 1983 TOTAL PROJ COST $ 5.1 M U.S.

ORIGINAL PROGRAMS PROVIDED A PHYSICAL PLANT, EQUIPMENT, TRAINED PERSONNEL AND PRIORITIES FOR FORESTRY RESEARCH. A SECOND, FOLLOW-ON PROJECT, STRENGTHENING THE FOREST RESEARCH INSTITUTE IS DIRECTED TOWARD GATHERING TECHNICAL ECONOMIC AND SOCIAL INFORMATION TO ENHANCE THE CONTRIBUTION OF FORESTRY TO RURAL COMMUNITY DEVELOPMENT. $3.4 M U.S.

FAO/UNDP DEVELOPMENT OF NATIONAL PARKS AND NATURE CONSERVATION

SPONSOR: UNDP EXECUTING AGENCY: WORKING PEOPLE'S SETTLEMENT DEPT
APPROVAL: (~~PENDING~~ 1981) COMPLETED: TOTAL PROJ COST: $3.24 M U.S.

CREATED TO AID IN SELECTION OF, AND TO PLAN A PROGRAM FOR ESTABLISHMENT OF, A SYSTEM OF MAJOR NATIONAL PARKS AND RESERVES AND THE LEGAL AND ADMINISTRATIVE TOOLS FOR MANAGING THEM. THE RATIONALE WAS THAT BURMA IS PARTICULARLY RICH IN FLORA AND FAUNA, BUT THAT THEIR DIVERSITY IS THREATENED BY HUMAN DISTURBANCE. SANCTUARIES NOW TOTAL ONLY 0.7% OF THE LAND AREA, AND EVEN SO ARE NOT WELL PROTECTED. BURMA IS SEEN TO NEED A BROAD SYSTEM OF PARKS AND RESERVES TO SAFEGUARD ITS VALUABLE AND OFTEN UNREPLACEABLE NATURAL RESOURCES AND ECOSYSTEMS.

FAO/UNDP INTEGRATED WATERSHED MANAGEMENT AND DRY LAND IMPROVEMENT

SPONSOR: EXECUTING AGENCY: FOREST DEPARTMENT
APPROVAL: (PENDING) TOTAL PROJ COST: $3 MILLION U.S. (EST)

DESIGNED TO DEVELOP INTEGRATED LAND MANAGEMENT PROGRAMS IN TWO SAMPLE WATERSHEDS TO SERVE AS DEMONSTRATION AREAS. INVOLVES PERMANENT RE-SETTLEMENT OF SHIFTING CULTIVATORS, INITIATION OF RANGE OF SOIL STABILIZING, FOREST REHABILITATING AND OTHER SOIL AND WATER CONSERVING MEASURES, AND TRAINING EXTENSION WORKERS AND VILLAGE LEADERS.

IN ADDITION TO THE ABOVE, SEVERAL TRAINING-ORIENTED PROJECTS WERE MOUNTED AS FOLLOWS:

FAO/UNDP TECHNICAL SUPPORT FOR FOREST EXPLOITATION/FOREST FELLOWSHIPS AND TRAINING. $0.25 M U.S.

FAO/UNDP REVIEW, REORGANIZE AND EXTEND THE EXISTING TRAINING PROGRAMS AND FACILITIES AT TECHNICAL AND VOCATIONAL LEVELS FOR THE FOREST DEPARTMENT AND TIMBER CORPORATION. $1.0 M U.S.

FINLAND WORKSHOPS ON WOOD-BASED PANELS TECHNOLOGY, PRODUCTION AND USES.

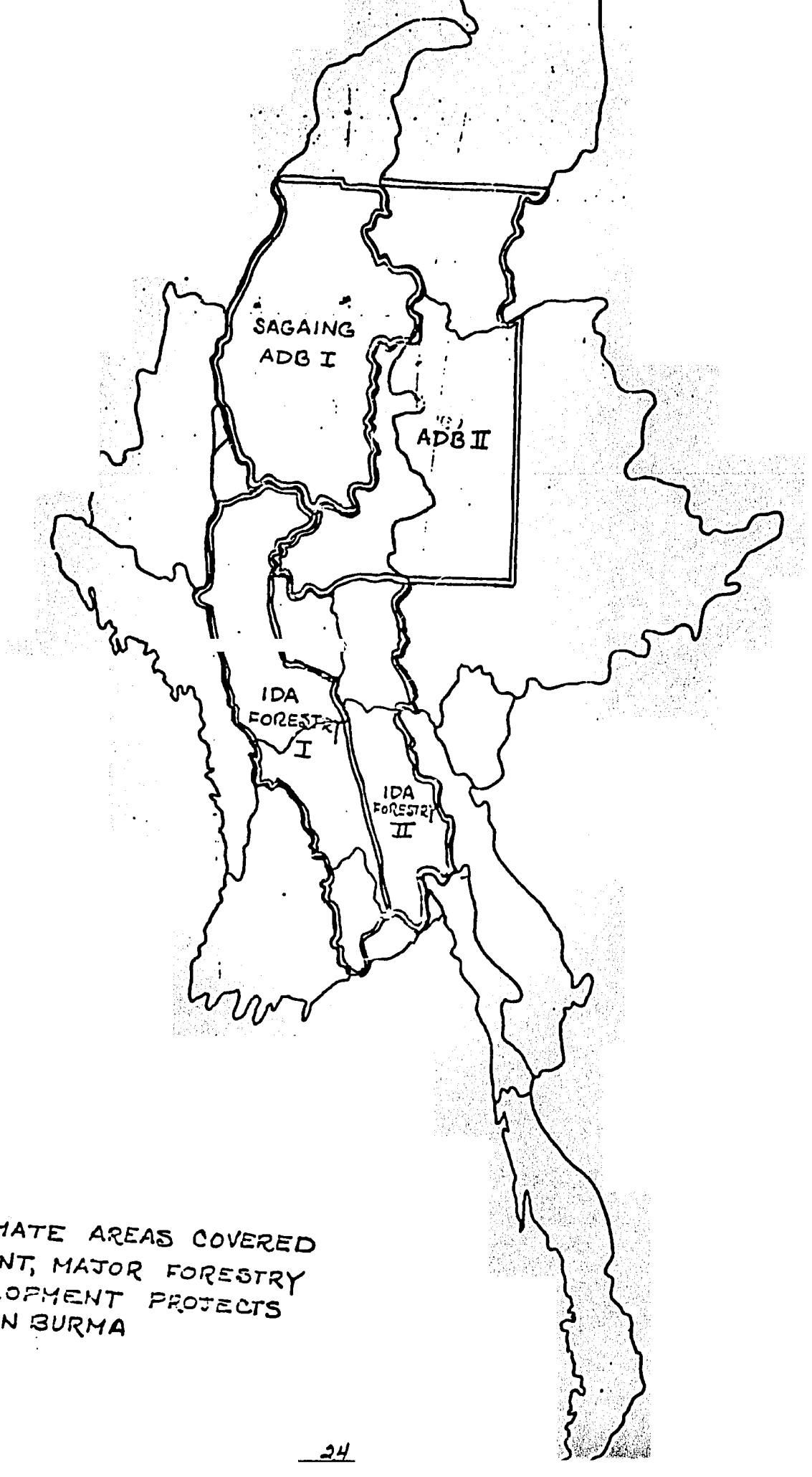
JAPAN SHORT TRAINING PROGRAMS IN AGRICULTURE AND FORESTRY. (EG. "FORESTRY AND FOREST PRODUCTS RESEARCH")

ADDITIONAL PROJECTS ALLIED TO FORESTRY AND TO FORESTRY/AGRICULTURE INCLUDE:

FAO/UNDP ESTABLISHMENT OF A PILOT PLANT FOR PULP AND PAPER RESEARCH AND TRAINING ON TROPICAL RAW MATERIALS.
SPONSOR: UNDP EXECUTING AGENCY: CENTRAL RESEARCH ORG.
APPROVAL: COMPLETION: TOTAL PROJ COST

WB/IDA TWO RUBBER REHABILITATION PROJECTS AND UNDP ASSISTANCE TO THE RUBBER GOODS MANUFACTURING INDUSTRY

THE REHABILITATION PROJECTS ARE DESIGNED TO INCREASE THE PRODUCTION AND PROCESSING CAPACITY OF GOVERNMENT-OWNED RUBBER ESTATES AND TO PROVIDE THE STAFF TRAINING AND TECHNICAL ASSISTANCE NEEDED TO MANAGE AND MAINTAIN THEM. THE MANUFACTURING -ORIENTED PROJECT SEEKS TO INTRODUCE NEW PRODUCTS AND NEW TECHNOLOGY INTO BURMA'S RUBBER MANUFACTURING INDUSTRY.



APPROXIMATE AREAS COVERED BY RECENT, MAJOR FORESTRY DEVELOPMENT PROJECTS IN BURMA