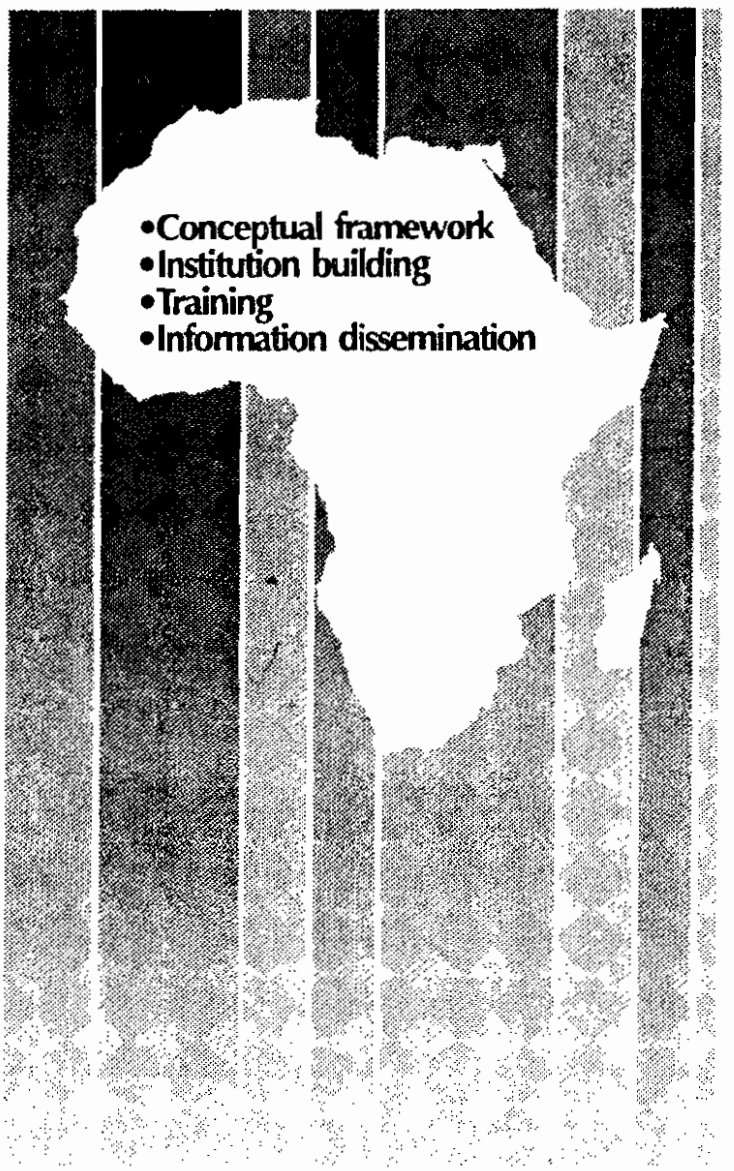
ECA/POP/TP/91/1 [1.1(ii)]

Manual for the Integration of Population Variables into Development Plans in African Countries



UNITED NATIONS
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ECA/POP/TP/91/1 [1.1(ii)]

MANUAL FOR THE INTEGRATION OF POPULATION VARIABLES INTO DEVELOPMENT PLANS IN AFRICAN COUNTRIES AT THE MACRO-LEVEL AND IN THE AGRICULTURAL SECTOR.

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ACKNOWLEDGEMENTS

The task of fostering present state of knowledge regarding the integration of population factors in the development planning (IPDP) process is obviously an arduous one and the various actors are engaged in mutually reinforcing each other's efforts. However, the preparation of the agricultural component of this Manual could not have been possible without the cooperation of the staff of the Economic and Social Policy Department of FAO (Rome).

In this regard, the ECA Population Division hereby wishes to express gratitude to colleagues from the latter organization and particularly to Mr. Allain Marcoux (Senior Officer, FAO Population Programme) and Mr. J. Vercueil (CAPPA's 'Father'). The initial consultations were held with Mr. Marcoux. Subsequently, both he and Mr. Vercueil read and commented on several drafts of the Manual.

Finally, our thanks also go to the staff of the United Nations Population Division (New York) who also read and commented on the initial draft of the Manual.

However, the ECA Population Division takes responsibility for any errors and/or omissions.

NB. Due to technical reasons, the content of this Manual has not been officially edited.

I. INTRODUCTION

The integration of population factors in development plans necessarily involves four interrelated tasks. The first is to clearly define the conceptual framework required for such integration. This is the core task because it raises questions regarding the tasks of who does what (ie. institution building); the training (if any) to provide the required human resources for operationalizing the integration process; and, the need to put in place a national focal point that should be responsible for disseminating the information generated by the integration process. Together these four tasks constitute a continuum and each country is located at a particular point along the said continuum depending on the stage of its development.

From contemporary experience, the enormous amount of effort and time devoted to fostering the integration of population factors in development planning by international agencies seem to focus mostly on the institution building, training and information dissemination aspects to the rather unfortunate neglect of the conceptual framework. In several countries of the ECA region, National Population Commissions (NPC) have been set up to coordinate such integration. Additionally, Population Planning Units and Data/Policy Units have been subsequently established to backstop the operations of the NPCs in the area of population policy development as an integral part of overall development planning. In a few countries, organizational structures have also been developed to implement the policy measures.

Equally, several global, regional and national training and research programmes on population and development planning have been established and funded mostly by the United Nations Fund for Population Activities (UNFPA). There are as well, several information, education and communication (IEC) programmes similarly established and funded within formal and informal educational systems. Even in the three areas currently receiving attention (ie. institution building, training and information dissemination), the level of cooperation among the key actors within the international community still has much room for improvement. For instance, all the related agencies of the latter community should normally participate in the National Seminars on population and development planning since these seminars constitute fora for exchanging ideas and knowledge on the IPDP process. This is presently not the case.

Of the four aspects of the IPDP process just noted, the one which has mostly not been given the attention it deserves in this context is the focus on the substance of the elements to be integrated. There is presently, no systematic and comprehensive text on the subject.

There is therefore an urgent need to remedy the current lack of coordination among the key players in integrating population factors into national development planning both at the national and international levels. Substantively, what is needed in fostering the IPDP process in the member states is the formulation of a complementary agenda of policy analysis, research, data assessment, monitoring and evaluation with explicit attention to the roles of the key players (eg. agencies/commissions responsible for data collection, research, training and planning).

The prevailing weakness among member states governments' capacity for undertaking policy analysis and research on population and development interrelationships and consequent dependence on technical assistance (in some of the states) should be remedied through the provision (ie. training) of needed professional skills as well as strengthening institutional resources for research. The NPCs should take seriously their role of coordinating research on population and development interrelationships so as to prevent and/or minimize duplication of efforts within the nation simultaneous with ensuring the dissemination of information of the findings from such research to all the associated sectoral ministries. Needless to add the importance of monitoring as well as continuously assessing and evaluating the national population trends along the lines of the ongoing efforts by the United Nations family on monitoring global population trends biannually since the adoption of the World Population Plan of Action (1974).

The ECA secretariat has been striving to fill the 'substance' gap at the international level. In 1988, in liaison with several of the international agencies working in the field of population and development planning, the ECA Population Division prepared a set of Guidelines for integrating population variables into development plans of African countries at the macro and sectoral (agricultural, human resources, education, health and housing) levels.

This Manual is the next step in this direction and is aimed at operationalizing the earlier Guidelines. Considerable part of the Manual is devoted to an explanation of what IPDP means as well as the mechanics of putting the IPDP process into practice at the macro level. Equally, much attention is devoted to a discussion of the IPDP process in the agricultural sector. In subsequent Manuals in the series, other sectors will be considered.

Regarding the agricultural sector, use is made of the CAPPA system developed earlier by the FAO for agricultural sector analysis (ASA). Admittedly there are other tools for IPDP. For instance, the simulation model on population and development developed by the Research Triangle Institute (RTI) incorporates three closely related modules namely population, education and macro-economy (including manpower and employment)1/. The simulation model can be used to demonstrate the integration of population variables in development planning in terms of population-education interrelationships. However, as the present Manual is focused on the agriculture sector, the FAO software "CAPPA" rather than the "RTI" software will be considered.

Reference is made in the Manual to other techniques that have been tried for agricultural sector analysis, such as linear programming, econometrical estimated models, systems dynamics, simulation models, general equilibrium models; these, however, are reported as not having fared well in practice. Consequently, country perspective studies were developed instead and these in turn led to the familiar 'Agriculture Towards The Year 2000' study (AT2000) by FAO. As indicated in the Manual, CAPPA derives from AT2000.

1/ United Nations DTCD, Simulation model on population and development: Game for Training (DTCD: New York, 1987), GLO-76-P35.

To date, the CAPPA system has been largely used to provide training in agricultural planning. It is hoped that by providing simple explanations of the various modules of the system as discussed in the Technical Manual, its use as a planning tool would be further enhanced. These explanations have been made in liaison with FAO; even then, the attempt here is largely preliminary. It is hoped that with time and as the knowledge base grows in the use of CAPPA in this context together with gains in experience regarding the IPDP process, the content and scope of this series of Manuals would be reviewed.

II. THE MEANING OF IPDP

The Problem

1. The content and form of population and development planning have changed considerably over time in the ECA and other regions. The post political independence plans (1960s) for countries in the ECA region concentrated on changing the productive structure (ie. rate of economic growth) of the economies. In that context, although projections of population size and growth rates were critical planning inputs, population factors were treated as exogenous in the process. Accordingly, despite creditable gains in per capita output at the time, the high incidence of poverty, un-employment and income inequality in the various countries of the region persisted.

2. Consequently, during the 1970s, the focus of development strategy in countries of the third world region was changed to the provision of basic needs. But since the required resources for the later strategy were not readily available, the scope of planning was extended in the 1980s to such areas as employment and income distribution; the population problem of these nations increasingly assumed a multivariate dimension. This necessitated the consideration of a broad range of linkages between population and socio economic variables in the formulation, implementation and evaluation of development plans.

3. Specifically, during the 1980s, it was recommended that the study of population problems should extend beyond questions of high fertility, high mortality and rapid rates of migration; and should include such factors as levels of nutrition, security in old age and the status of women. It was also recommended that development should not be defined simply in terms of increases in GDP or even GDP per capita but should be considered as a process of interrelated economic, social and political changes; the ultimate aim of which should be to promote an improvement in the well being of the entire population2/.

4. An integrated approach to population-development planning has thus been strongly advocated since the mid-1980s. A desirable contribution to developing countries generally, therefore, is the 'modus-operandi' for operationalizing the said integration process.

5. In this regard, the lead has been provided by the Headquarters of the United Nations Population Division (UNPD) at the global level. Following an exhaustive research effort, the UNPD has, to date, published two modules of projection methods for IPDP.3/ Substantively, the first module covers the UN components method for preparing population projections and the headship rate

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2/ United Nations, Proceedings of the expert group on population, resources, environment and development, Geneva : 25 - 29 April, 1983 (United Nations: New York,1984), ST/ESA/SER.A/90.

3/ These include United Nations, Projection methods for IPDP,vol. 1 (Conceptual issues and methods for preparing demographic projections), New York,1989; and vol. 2 (Methods for preparing school enrolment, labour force and employment projections), New York,1990.

method for making household projections. The second module focuses on the modalities of preparing school enrolment, labour force and employment projections. Both are very detailed expose of the areas covered. However, by virtue of their intended global audience, regional peculiarities regarding data and methodology constraints cannot be sufficiently addressed .

6. It was in view of this consideration that the tenth issue of the African Population Studies Series (APSS10) reviewed the status and prospects of population policy development (including the regional efforts (at the time) in preparing population projections) during the 1980s at the regional level in ECA member states4/. Among other things, the review stressed that the formulation aspect of population policy development in the ECA region was fairly well put in place during the 1980s together with the relevant documentation.

> " The 1980-90 decade can be regarded as one during which the 'know-how' for population policy formulation was fairly well ' put in position ' within most member states in the region. In terms of pertinent documentation at the regional level, there are (i) the proceedings of the Regional Training workshop on demographic estimates and projections held at RIPS (Accra,Ghana: July 15-29 1985), volumes 1 and 2 ; (ii) 'Guidelines for integrating population variables in the development plans of ECA member states 'presented to the fifth session of the Joint Conference of African Planners, Statisticians and Demographers in March, 1988; (iii) the ' status and prospects of population policies in ECA member states ' published in APSS10 (December,1989); and, (iv) the series of monitoring reports of the implementation of the KPA recommendations presented to various sessions of the Joint Conference of African Planners, Statisticians and Demographers starting in 1986 (ie. the fourth session of the Joint Conference). This paper urges ECA member states that are yet to formulate their population policies to use the principles in these documents5/ as a 'modus operandi' ".

7. Subsequently, in a paper presented to the 16th session of the ECA Conference of Ministers of Planning and Economic Development, the ECA Population Division, among other things, discussed five strategic policy areas that member states should address during the 1990s. These are (i) simultaneous implementation of national population and development programmes; (ii) undertaking several studies in the various areas of population dynamics particularly on the profile of specific population groups (eg. youths, the aged, the disabled,etc.; role of women in the development process; determinants of the levels and trends of fertility; interrelationships between child and maternal mortality and fertility;

4/ UNECA, "Status and prospects of population policies in ECA member States", African Population Studies Series,No. 10 (UNECA: Addis Ababa, 1989).

5/ These include (i) UNECA, Report of the Regional Training Workshop on demographic estimates and projections in Africa (Accra, Ghana: July 15-29 1985), vols. 1 and 2 (UNECA:Addis Ababa,1986); (ii) UNECA, "Guidelines for integrating population variables into development planning for ECA member States", E/ECA/PSD.5/41; (iii) UNECA, "Kilimandjaro programme of action (KPA) on population - follow up", E/ECA/PSD.4/41; (iv) "Implementation of the KPA",E/ECA/PSD.5/42; and, (v) UNECA, "Evaluation of experiences of ECA member States in the implementation of the recommendations of the KPA", E/ECA/PSD.6/21.

mortality and fertility; problems of drought, desertification and refugees; etc.) ; (iii) integration of population factors in development planning; (iv) data collection, training and research; and, (v) information dissemination. The challenge for ECA member states, during the 1990s, will be to determine the modalities of 'action programmes' for implementing the identified policy strategies6/. In particular, following these achievements of the 1980s,the next logical step at the regional level is to translate the said 'GUIDELINES' (indicated in Para 6 above) into MANUALS to illustrate the various steps in the integration process.

8. This is the task of this Manual. The critical issue is that existing population programmes (in the region) by funding agencies tend to focus on (i) the strengthening of the capability of member states in the area of formulating and implementing population policy as an integral part of overall development planning strategy; (ii) providing training (at the global7/, regional8/ and national9/ levels) aimed at filling gaps identified in such capability building; and/or, (iii) establishing national focal points for disseminating information aimed at fostering the IPDP process. In all these efforts, the substance of the conceptual framework for the IPDP process is not sufficiently addressed. There is a need to provide the Population Planning Units in the various Ministries of Planning and/or Health in the member states with a common document that meets this deficiency in the IPDP process.

9. In the ECA Guidelines noted earlier, this issue of the conceptual framework for the IPDP process was addressed. The objective of this Manual is to operationalize the 'GUIDELINES' at the macro and agricultural sector levels. Other sectors (eg. education,health,housing, etc) will be considered within subsequent biennia work programmes of the ECA Population Division. The selection of the agricultural sector as the first sector in this regard is predicated on two major considerations. First the sector is the bedrock of the economies of

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6/ UNECA, "Population issues for ECA member states during the 1990s", 16th Meeting of the ECA Ministers of Economic Development and Planning, Tripoli (Libyan Arab Jamahiriya), 15-19 May 1990, E/ECA/CM.16/34.

7/ To date four long term component training courses of the Global Programme (in population and development planning) have been established in association with (i) The Catholic University of Louvain (UCL) at Louvain-la-Neuve,Belgium jointly organized by the Institute of Demography and Institute of Developing Countries Studies (for French speaking candidates); (ii) The Centre for Development Studies (CDS) at Trivandrum, Kerala State in India (for English speaking candidates); (iii) The Institute of Social Studies (ISS) in cooperation with The Netherlands Interdisciplinary Demographic Institute (NIDI) at the Hague (for English speaking candidates); and, (iv) The Latin American Demographic Centre (CELADE) at Santiago, Chile in cooperation with ECLAC (for Spanish speaking candidates). Presently, all four centres are operational. The fifth centre at the Cairo Demographic Centre (CDC) at the University of Cairo (Egypt) is only being established; this will be operationalized at a latter date.

8/ For instance, the United Nations Regional Institute for Population Studies (RIPS) at the University of Legon (Ghana) for English speaking African countries; and the Institut de Formation et de Recherche Demographiques (IFORD) for French speaking African countries.

9/ Reference is here being made to several Demographic Training and Research Centres already established and funded (largely by UNFPA) in the Universities of several African countries.

most ECA member states; a large proportion of the GNP in the latter derives from the sector. Secondly, with the increasing emphasis on women in the development process, it is noteworthy that based on estimates for the 1980-90 period, the proportion of women in the total labour force of the ECA region varies from nine (Algeria, Libyan,A.J.) to 48 (Benin, Mozambique) per cent. In the agricultural sector, this proportion varies from 1 (Algeria) to 60 (Mozambique) per cent10/.

10. Thus the role of agriculture in the development process of ECA member states is not only dominant; it is moreso for the females - a key consideration for the development prospects in the 1990s. More importantly, as more ECA member states are currently embarking on comprehensive programmes of adjustment with transformation,fundamental structural changes are needed to transform these economies in an increasingly competitive world11/. In this regard, it has been suggested that these economies should grow by at least 4-5 per cent annually if they are to provide jobs as well as achieve food security and improved living standards12/.

11. Available evidence indicates that whereas population growth rates in the African region have been increasing over the 1960-80 period with no indications towards a decline during the 1990s, the corresponding rates of food production have been declining. Among the factors identified for the resulting crisis characterized by inability to feed the growing population are biassed public policies of the ECA member states; decline in the rate of land development; lack of technological change; and, environmental degradation13/. Three strategies have been suggested to overcome the crisis : land/irrigation development; raising productivity; and, formulating effective population policies as integral parts of overall development strategy.

12. In this context, "recent droughts provide only a partial explanation of the decline in per capita food production in subsaharan Africa where population growth will account for almost the entire growth in the demand for cereals (from 77 million tons in 1979-81 to around 200 million tons in 2010) during which time production is expected to grow by 2 per cent annually to 100 million tons meeting only one half of the total demand. Only part of the deficit can be filled by imports from developed countries. A greater part of the gap must be closed by putting new arable land under cultivation at a more rapid rate. The more promising approach would be to raise yields per hectare closer to realizable levels. Slowing the rate of population growth at the same time would not only

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10/ United Nations, The situation of women : selected indicators,1990 - WORLD CHART (United Nations: New York,1990).

11/ UNECA, "Implications of the apparent impact of structural adjustment programmes (SAPS) on population", 17th Meeting of the ECA Ministers of Planning and Economic development, Addis Ababa (Ethiopia), 9-13 May 1991, E/ECA/CM.17/10.

12/ World Bank, Sub-Saharan Africa : From crisis to sustainable growth - a long term perspective study (The World Bank: Washington D.C. , 1989).

13/ United Nations, Planning agriculture (FAO: Rome,1986).

reduce demand but permit channelling of more resources into agricultural development. Furthermore, it would lessen rates of soil degradation caused by cultivating marginal lands and reducing fallow periods. Over the longer term, the greatest scope for expanding the population supporting capacity of land lies in technological improvements especially those closely related to present systems of farming. There is evidence that African governments are now implementing policies to promote production" but as yet, few have taken steps to implement an effective IPDP process14/.

13. It follows that agriculture at least during the 1990s, should constitute the main foundation for growth within the overall national socio-economic development programme of the ECA region. Again in this regard, it is suggested that food production should be doubled if the region is to cope with the rapidly increasing population as well as overcome malnutrition.

14. At a theoretical level, agricultural sector planning should raise the sector's productivity to provide a surplus for industrial investment. But it is a difficult sector to plan because it is less amenable to the application of large range of population based forecasting and programming techniques using demographic variables and indicators as essential ingredients. The government does not 'create or close agricultural enterprises at will; does not hire farmers as it does teachers or nurses; and, can hardly dictate to the many other operators of the sector their objectives and mode of production'15/. Additionally, the number of producers in agriculture is much greater; operations are 'time- bound'; products are perishable; and efficiency is a function of physical, structural, political and cultural factors.

15. In the balance of these Introductory remarks, the meaning of IPDP is outlined. Section II then discusses the various activities involved in IPDP at the macro and agricultural sector levels together with the COMPUTERIZED SYSTEM FOR AGRICULTURAL AND POPULATION PLANNING ASSISTANCE AND TRAINING (CAPPA) as developed by FAO for agricultural sector analysis (ASA). Since the conceptualization of CAPPA is original with FAO, a simplified version of the Technical Manual regarding the basic operational steps in using the system for ASA is presented in the ANNEX to facilitate the use of CAPPA for ASA. In such usage either as a training or planning tool, it is desirable to do so simultaneous with the discussion contained both in CAPPA's Technical Manual (1985 version) and the associated Manuscript on "Setting targets for the agricultural planning"16/.

14/ David Norse, "Population, resources and food in Africa", in Population Bulletin of the United Nations, Nos. 21/22- 1987 (United Nations:New York,1988), ST/ESA/SER.N/21-22.

15/ Marcoux,A., " Prospects and requisites for population integration in agricultural and rural planning", International Symposium on population and development ,RIGA, Latvian SSR, 4-8 December 1989, IESA/P/AC.29/26.

16/ Vercueil,J., Technical description of the CAPPA system (United Nations :FAO, Rome 31 July 1985), W/R7273, mimeographed; see also Vercueil, J., "Setting targets for agricultural planning", (FAO:Rome, 1989). Report prepared under the project GHA/88/P04 (Use of population variables for modifying agricultural production targets and policy decisions).

16. The objective in presenting the simplified version of the Technical Manual in the ANNEX to this Manual is to foster Interagency Cooperation. By liaising with FAO in providing systematic explanations of the technicalities in the various modules of the CAPPA system, it is hoped that the training and planning foci of the enormous efforts already made by FAO in the area of ASA will be enhanced.

Development and IPDP.

17. In discussing the meaning of IPDP, a pertinent issue to resolve first is the meaning of development. Several attempts have been made at explaining the latter. Some of these use varying sets of criteria; others have used indices. Among the early explanations based on sets of criteria is the prerequisite that for a country to develop, it should be endowed with an organized nationhood and internal peace; a minimum of utilizable natural resources; a willingness on the part of the population to make the necessary effort required to produce goods and provide services, receive foreign implantations, accept the product of scientific investigation and discard traditional ideas; external peace and absence of foreign sabotage of development efforts; and, a government that is controlled by modernists17/. A related explanation also based on sets of criteria views the development process as more or less evolutionary being a continuum from a 'traditional' society through preconditions for 'take-off' and the 'drive to maturity' to the age of 'high mass consumption18/.

18. One of the criteria based on indices uses the per capita income index to designate a country as poor or rich depending on the size of its per capita income. The human suffering index has been developed to measure with a single composite figure, differences in living conditions between countries. More recently, attention has been drawn by the United Nations Development Programme (UNDP) to the need for planners to focus on human development in designing their national programmes and strategies19/. Human development, it is argued, should be seen in the light of how economic growth is managed and distributed for the benefit of the people. Central to this process of human development is the enlargement of people's choices, the most critical of which are to live a long and healthy life, to be educated and to have access to resources needed for a decent standard of living; progress in human development can be gauged from the degree of political freedom, guaranteed human rights and personal self-respect.

19. Although each of these and other attempts at providing an explanation of development have been criticised, they have been used at varying times to indicate in a general way, the aims, objectives and goals of economic development efforts. Among the several goals of economic development are a steady

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17/ Meier,G.M., Leading issues in development economics (OUP: New York, 1964).

18/ Rostow, W., The stages of economic growth (Cambridge: CUP,1960).

19/ UNDP, Human Development Report 1990 (Oxford Univ. Press, 1990).

growth in consumption and income per head; an increase in the quantity and quality of the factors of production (especially labour); full employment of the abundant factors of production (usually labour); the establishment of an egalitarian society; and, other cultural aims (e.g. the emancipation of the under privileged groups, the enhancement of personal freedom, etc.).

20. On the other hand, population policies have different goals. For instance, policies aimed at influencing population growth rates or fertility levels have the goal of either raising, maintaining, or lowering existing rates and levels. In the case of spatial population distribution, the various options include an acceleration, deceleration, reversing or maintaining rural to urban migration. From the few existing policies on international migration in African countries, the goals include raising the rates; maintaining current rates but subject to strict control; and, curbing future emigration and immigration simultaneous with maintaining already established emigrant and immigrant populations. As noted earlier, strategies to achieve these goals have changed remarkably since the end of the second world war.

21. Besides these efforts at explaining the meaning of development, it is also pertinent to indicate what development planning involves generally and integrated planning in particular. Development planning is the fundamental instrument by which a government can rationalize and foresee the development of a country from a comprehensive perspective of economic and social factors in the short, medium and long-terms. Every aspect of development considered to be of strategic importance in relation to particular problems of a country receives explicit treatment in a development plan.

22. The preparation of a development plan is initiated by the drawing up of an image-objective of the future of the country including the size, structure and distribution of its population. The country's history of development, the functioning of its economy, its social structure and institutions as well as its position in terms of international relations and trends are studied and projected into the future20/.

23. In order to attain the image objective, there should be a (development) strategy composed of a set of economic, social and demographic policies designed to take advantage of the most dynamic aspects of the country capable of generating the surpluses and investments required to foster growth and improved distribution of income and services.

24. IPDP has different meanings depending on context21/. "For macro-economic planners, integration involves taking account of projections of size,age sex structure and spatial distribution of the population in determining food, employment and basic needs (eg. education, health, housing) requirements. For socio-economic demographers, integration involves the formulation of socio-economic policies to influence demographic trends and achieve higher

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20/ Clark, P.G., Development Planning in East Africa, (East African Publishing House, 1985), chap. 1.

21/ Herrin, A.N., Towards operationalizing concepts of integration of population and development planning: The Philippine experience, Nupri Research Paper Series, No. 21 (March 1985).

standards of living. For health planners, integration could mean the addition of family planning activities to ongoing development programmes in health, nutrition, education, rural development, etc.; the use of established development programmes to carry out family planning activities; or, a family planning strategy that uses a development project as an entry point for the dissemination of family planning information and for motivational campaigns to increase the use of family planning methods".

25. Deriving from all these alternative meanings, a useful operational definition of integration, therefore, is "the explicit consideration of socio-economic and demographic interrelationships in the formulation of development policies and programmes to achieve the nation's development goals and objectives"22/.

26. IPDP involves incorporating demographic variables and projections as inputs to sectoral and regional planning; determining the demographic impact of diverse economic and social programmes; and, defining those complementary and specific actions needed to induce increasing balance between demographic dynamics and economic potential23/. In effect IPDP implies that demographic variables are taken into account in the elaboration of development plans; formulating population policies within the context of development policies; and, integrating the processes of development and population planning24/ with the ultimate goal of eliminating and/or minimising poverty, unemployment and inequality; the three desiderata of development efforts25/.

27. There is, nevertheless, less room for IPDP in the agricultural sector26/. Aside from planning its own investments, the government may only try to influence the behaviour of farmers in a particular direction or solve some specific problems through appropriate policies. Other characteristics of agricultural planning that obstruct IPDP include the tendency to focus on national, aggregate production objectives simultaneous with preparing area investment projects thereby ignoring the impacts of decisions at the level of specific categories of population; the frequent lack of a real long term perspective; and, the lack of adequate procedures for the monitoring and evaluation of implementation programmes.

28. Accordingly, promoting IPDP in the agricultural sector should (i) propose tools that integrate population variables in currently practised planning exercises (eg. setting of national targets and preparation of investment

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22/ Herrin, A.N. (1985), op. cit.

23/ Marcoux, op. cit.

24/ Together these are the three steps of increasing difficulty towards integration. Such integration can be sought between either the diverse project (and sectoral) programmes through a macro level plan or between the programmes of the nation and those of the subnational units (eg. sectors).

25/ Todaro,M.T., Economic development for third world countries (McGraw Hill,1985).

26/ Ibid.

projects); and, (ii) stimulate methodological development in areas of value to IPDP (eg. regional planning). As it will be discerned from the ANNEX, CAPPA , among other things, enables the user to analyze agricultural sector employment policies. By implication, its relevance to the essence of development efforts (noted earlier) as well as the theme of this Manual is readily obvious.

III. ACTIVITIES TO FOSTER THE IPDP PROCESS.

29. Three basic elements of integration apply to any planning level (macro, sectoral and project) namely a definition of the conceptual framework; determination of development objectives; and, the formulation of policies and programmes and projects designed to achieve the development objectives.

30. Given these basic elements, the logical next steps in IPDP are questions relating to who does what ? (ie. institutional infrastructure); otherwise whether the country possesses necessary expertise to perform all the tasks involved ? (ie. training); and, how does the information generated by the process get disseminated within the system (ie. the need to put in place a national focal point to foster the dissemination of population-development related information generated by the IPDP process). These four main elements are discussed in this section at the macro and sectoral levels of IPDP.

III-(i): THE CONCEPTUAL FRAMEWORK FOR THE IPDP PROCESS.

31. Regarding the conceptual framework for IPDP at the macro level, a first step is to set up a unit within the country's planning machinery with the task of developing demographic accounting frameworks to provide planners with estimates of the numbers of persons (in the population) with specific characteristics during the plan period27/. Operationally, this involves undertaking appropriate research on the interrelationships between the country's population and development related data using relevant economic-demographic models. The implications of such interrelationships for population policy should then be used as a basis for determining the demographic objectives of the overall development plan. Appropriate policies and programmes should then be formulated pursuant to the set objectives.

Determination of the population-development interrelationships

Required data

32. In order for population factors to be endogenized within the development planning process, the demographic policies and programmes of the national development plan should, as a rule, derive from rather exhaustive research findings of the population development related data. In other words, the demographic objectives of the development plan should be based on the established interrelationships between population and development related data assembled for

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27/ This is the Population Planning Unit (PPU) discussed later in this section. Implicitly, the envisaged 'plan period' refers to a perspective period of about 10 to 20 years. This has to be the case because the value of IPDP emerges only if long-term analyses are effected to set the background for medium term planning.

the base year of the plan period as well as the projection of such interrelationships through the horizon year of the development plan.

33. In this regard, a first step to be taken by the designated Unit in ascertaining these interrelationships should be to compile the relevant population-development related data for the country both at the macro and sector specific levels. In this connection, the pertinent issues to be considered in assembling the said data are the determinants of fertility, family planning practices, age at marriage, investment in family planning facilities, fiscal incentives related to acceptance of family planning practices, contraceptive research, fiscal and other incentives to corporate or voluntary bodies involved in family planning, and, the whole class of issues related to the organization, implementation and evaluation of family planning delivery systems28/.

34. The second set of issues in this context should include health programmes for reducing infant/child mortality, pre/post natal care, improving the health status of women, educational policies connected with improvement of the understanding of family health, improvement of female literacy and educational levels, and improving the nutritional status oftarget groups of the population especially women and children. The last set of issues should include programmes of integrated rural development and/or the use of public works for generating employment for target groups, questions of subsidies relating to food grains, plans for the uplift of target populations like small farmers, landless labourers, artisans, slums dwellers and the urban poor.

35. Given these issues, one pertinent set of demographic data requirements for IPDP are a detailed analysis of the country's past population growth experience. Such analysis is essential for evaluating socio-economic performance and the effectiveness of policies. The survey of past experience serves the purpose of conditioning the planner to behaviourial constraints over which he can assume little control and isolating the policy variables over which he has control.

36. A second set of demographic data requirements are rural/urban and regional forecasts. These are required by the planners both for aggregate investment and planning decisions as well as for policy analysis. The larger the country (size), the higher would be the criticality of these estimates. In smaller countries (size) external migration data may be more important.

37. A third set of data requirements is the difficult area of the factors determining family planning performance. Expected trends in such data and possibilities in the future are important for the population forecast itself. Estimates on determinants of demographic behaviour need emphasis since population programmes have to compete with "hard" economic investments in which benefits can be quantified.

28/ UNFPA, "Implications for UNFPA of the international conference on population,1984", Report of the ACC Ad Hoc Task force on the international conference on population,1984 (New York); see also UNFPA, "Population policies in development planning: an information note from UNFPA", International Forum on population policies in development planning (Mexico City, 4-7 May, 1987).

38. Based on these considerations, the data requirements for IPDP (at a macro level) include information on population size, age-sex structure, rural-urban and other spatial geographical regions distribution, estimates of fertility, mortality and migration rates. In general, planners require a greater awareness of the current state of knowledge on demographic levels, trends and relationships. In order to foster IPDP, they should be provided with an inventory of available data which would include the identification of the subject matter, the source of the data, the size of the inquiry, the population covered, the organization responsible for collecting the data, when the data was collected, its current location and the form in which it is available.

39. Regarding fertility levels, trends and differentials, it is particularly important to have the analysis on original data collected specifically tailored for the purpose. On mortality, estimates could be derived indirectly. The formulation of policies and plans in the field of migration require improved data on how many persons move, who they are, where and why they move. These data should be collected using appropriate time intervals, spatial units and definition of types of movement for migrant households in both areas of origin and of destination. The collection effort should also include information about the initial flows of money and goods to the migrant and the later return flows of remittances.

Research required.

40. The assembled base year data should be used by the designated Unit to establish pertinent population development interrelationships with an appropriate model as discussed in the next section. Although details of the use of an econometric model in this context are discussed below, consider a case in which a study using such a model, reveals a statistically significant negative relationship (holding constant other variables in the model) between estimates of a population growth component (eg. fertility) for the base year of a plan period and a corresponding development-related variable (eg. the level of literacy). The logical implication (on face value) would be that in the course of implementing the development plan, if the level of literacy within the population could be raised, it would tend to effect reductions in the fertility levels of the country over the long run.

41. The relationship, however, is not as simple as it first appears. Let it be further assumed that the literacy data used in the study relates to the proportion of primary level educational attendance for each of the country's political unit selected. But available evidence (from empirical research findings) is not conclusive on whether the said negative relationship would hold when the total national population is considered. What is frequently reported is for the rural population.

42. That is, if data on the fertility levels (eg. estimates of age standardized mean number of children ever born) of rural females is correlated with that on the corresponding proportions of illiterates, a negative

relationship has frequently been reported in various empirical studies29/. Such findings are analogous with identifying rural illiterate women as a target group which a development plan objective could focus in terms of envisaged reduced fertility potential.

43. The various interrelationships so derived between population factors on the one hand and development related variables on the other hand could then not only be used to identify target groups as in the case of fertility levels just illustrated, but they should be projected over the plan period. It is to be noted that the quality of planning decisions is extremely dependent on the quality of these projections and hence their accuracy should be given the highest priority. In this regard, it is pertinent to caution planners about the fact that such projections are not predictions. Given faulty base year data, the projections may not closely correspond to future events.

44. Here and basic to the IPDP process, is the national population projection. One body should be charged with the responsibility of deciding on the one projection to be adopted by all sectors during a given plan period. This is important since refinements in population projections can make or mar the logic of a plan30/. Obviously, the manner in which population projections determine investment decisions is through assumptions made on population growth components particularly fertility and mortality in the medium and long-term periods. The question of the details of a well worked out population projection by itself gets at the heart of the two way interrelationship between population and development variables.

45. To reiterate, the base year population estimates and projections thus prepared should be translated into estimates of socio-economic interrelationships requirements. Once planners have reliable demographic estimates and projections, research is necessary to identify and measure the consequences for development as well as ways in which development activities might alter population levels and trends. The pertinent question is: what kind of population research (for development) needs to be undertaken?

46. There are three important research activities required for IPDP. These include preparing estimates and projections of demographic levels and trends; ascertaining the nature and strength of demographic and development interactions; and, conducting various forms of policy analysis. Research on the socio-economic correlates of population growth components may indicate to planners how best to modify population variables. One important consideration in this regard is to ensure that the demographic objectives of the development plan are not simply derived from a list of national aspirations. The task of research in this context is to demonstrate the importance of population in the process of national

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29/ See for example the series of studies referred to in UNECA, "Regression analysis of factors affecting spatial and subregional differential fertility in Africa", Population dynamics :fertility and mortality in Africa (UNECA: Addis Ababa,1979),ST/ECA/SER.A/1.

30/ For pertinent recommendations on the place of population projections in planning within the ECA region, see UNECA, Report of the regional training workshop on demographic estimates and projections, Accra... op. cit, vol 1. pp.11-15.

development and the feasibility of implementing alternative programmes for influencing population dynamics. On research priorities, there is a need to review past research related to population.

47. These research priorities for IPDP would differ from one country to another. In some countries research on mortality and population distribution would be important; in others, fertility and population growth might be. The national priorities for research should focus on (i) national objectives in population and development; (ii) the availability of data; (iii) the availability of suitable conceptual frameworks and research methodologies; (iv) prospects for using the research findings; and, (v) the availability of technical expertise.

48. To be relevant for policy, research findings should indicate what governments can do to effect change. For example, with fertility, policy-oriented research should attempt to deal systematically with the instruments which planners can use to alter fertility levels.

49. Overall, however worthwhile a research topic might be, in the end, the justification of any research should depend largely on the extent to which its findings were used. Therefore as far as feasible, potential users of research findings for IPDP should be involved in the early stages of research formulation to ensure that their data needs would be fully incorporated into the research process. In addition, meetings, seminars and workshops should be organized at the inception and conclusion of the research to bring together researchers and possible users.

Modelling for IPDP

50. Development planning is a mechanism for transforming development policies into a consistent design composed of instruments and quantified targets. The planning decision is generally made through a process of consultation, review, study and sometimes with the aid of formalized decision making models. There has to be an appreciation of both the formal and the effective processes through which annual investment and/or outlay decisions are made and to recognize that population variables are important in these decisions. These variables will have to be considered explicitly.

51. Once the goals of policy-makers have been translated into targets, planners can determine the resources required (or means) to meet each goal and thus compare the costs and benefits associated with each. This necessitates the formulation of a model which defines the critical relationships between the means and the targets. The specification of the model is thus a critical step in the planning process.

52. The place of models in IPDP, therefore, is to serve as the framework for viewing socio-economic and demographic interrelationships. They also serve to redefine the problem in more precise terms; determine specific requirements; and, generate the projections which will be used in constructing the plan. They are used for testing the impact of various demographic options (eg. high, medium or

low fertility); alternative rates of population growth; urbanization rates); over certain strategic economic variables (eg. investments, growth of GNP or rate of inflation).

53. Planners now have available to them a large number of models encompassing a wide variety of modelling techniques31/. Socio-economic demographic (SED) models are among the models which are required for effective IPDP. Yet none of these models has had much impact on planning. Besides the inadequacies of currently available models and computational facilities, planners and policy makers are not fully aware of the ways in which these models could facilitate their work.

54. There is therefore the need for a much greater input from planners into the entire model building process which involves a definition of the problem to identify the variables that constitute the objectives of the plan; specifying a structure of the model to be used; estimating the parameters of the model; carrying out the needed computations; validating the results of the computations; documentation and application.

55. Concerning structure, the strategies suggested include building models that contain many more elements than are essential in order to allow the important effects to emerge through sensitivity analysis; formulating a simple model and gradually expanding same: and, basing the design on the objectives of the plan. Priority should be given to building models of smaller scope tailored to fit the particular planning concerns of the country simultaneous with maintaining the pace of development of more complex models in order to serve the needs of basic research.

56. Regarding the estimation of model parameters (i.e. the coefficients), the importance of reliable data and the use of a well defined methodology have been stressed. In particular, the use of econometric techniques and international cross- sectional data have been commended; preferably country-specific data should be used. Equally, population-development models should be properly validated using data other than those utilized in estimating the model parameters. Validity, however, is but one means of enhancing the utility of a model. The usefulness of the model also depends on the quality of the data base, the estimation procedures, the internal consistency and plausibility of model outcomes as well as their sensitivity to changes in model parameters. The usefulness of a model to planners depends, as well, on whether

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31/ Among the major types of economy-wide population development models in use are the Harrod-Domar neo-classical growth models, inter-industry models and systems-dynamic models. For details see Horlacher,D.E., "Population - development models in relation to planning", in Population and development modelling (United Nations: New York,1981),pp.32-61. Regarding the use of models in sectoral analysis, it should be noted that 'economy-wide economic-demographic models are normally composed of an economic submodel describing the process of production, distribution and consumption; a demographic model describing fertility, mortality and migration; and, a set of linkages between the two submodels. These linkages may be thought of as sectoral models. Whereas the purpose of economy-wide models is to bring to light the indirect consequences of alternative socio-economic and demographic policies, the purpose of these sectoral models is to study the direct effects of policy to determine its direction and intensity'.

it contains policy instruments and the degree to which decision makers can trust projections derived from it.

57. The entire task of model building from data collection and design to the appraisal of the results should be performed as a team project including the country personnel, persons with experience in constructing population development models and international experts. The model builders should be encouraged to remain in the country; model building will have a lasting value if it is a continuous process. The model building process itself should be conducted either in some branch of the government or in a university or research foundation under the auspices of the planning agency.

58. In the initial phase, the model builders, planners and policy-makers should agree on the problems to be addressed, the goals to be pursued, the priorities to be assigned and the alternative strategies to be considered. The model assumptions should be carefully stated as well as their implications. The mechanisms that link the variables should be carefully explained and the policy control variables available to planners highlighted. Rather than transferring a complete population development model to another country, it would be better to introduce demographic components into models which are currently being used for planning and policy making. By developing appropriate sub-models and integrating them into the larger development models already in use, albeit elsewhere, human resources would be economized.

An econometric model for macro level analysis of IPDP(some hints)

59. Several references have been made in this section regarding the potential of an econometric model (eg. multiple correlation and regression technique) in determining the population development interrelationships . A few relevant hints in such usage will be made here in case the user of the Manual opts for its application.

60. Once a research problem has been defined (eg. to determine the socio-economic correlates of a population growth component), the multiple correlation and regression technique can be and has been used to study the interrelationships between population and development related variables for a given nation32/. In this particular context, usually such usage is predicated on the threshold hypothesis which asserts that fertility begins to decline in the course of passing through a threshold zone of development as measured by selected economic and social indicators33/.

32/ For several of such studies and usage see UNECA (1979), "Regression analysis of factors affecting spatial..... ", op.cit.

33/ The problem with the hypothesis is how to determine the 'threshold. See for example, United Nations, Interim report on conditions and trends of fertility in the world,1960-65 (United Nations:New York,1972),Sales No. E.72.XIII.3.

61. For instance, the influence of education on fertility operates through several channels. Prolonged schooling necessarily raises age at marriage; and with rising age at marriage, fertility tends to decline. Education itself is directly related to rationality and planning and these conditions are pertinent to the adoption of family planning and contraceptive usage. It is also to be noted that education is related to occupation and income. With higher education, opportunities for higher-income professions and white-collar occupations can be expected. All these are pertinent to the adoption of the small family norm or reduced fertility. In this regard, female education is particularly important since the educated female is expected to engage in occupations that are not home-related, thus generating a conflict in her role as a worker and mother. This seems to be borne out by several studies.

62. Although religion is recognized as one of the most significant social/psychological factors influencing human fertility behaviour, little is known about the relationship between religious affiliation and fertility. Elsewhere, the pattern of religious differentials in fertility conforms to the differences in the religious prescriptions concerning family planning practices and valuation of children. Religions that are pro-natalist in orientation include Islam, Catholicism, Bhudhism, Hinduism, etc.

63. The interplay of culture and religious belief in a country with a multiplicity of ethnic groups makes the study of religion and fertility in any country difficult; it then becomes difficult to attribute fertility behavioral patterns to differences in religious philosophies in such a population.

64. As a demographic indicator of development, urbanization is often cited in association with fertility transition. High fertility is a distinctive feature of a rural population, where it is required to complement agricultural labour force and neutralize the characteristically high mortality situation. In an urban environment, the conditions are different. As a sociological characterization, urbanism (or the way of life of urban dwellers) is typified by secularization, secondary group relationships, voluntary association, increased segmentation of roles and poorly defined social norms.

65. Two important patterns seem to have emerged from the literature on rural and urban fertility in the different countries of the region. The first is a rural-urban differential that is in favour of urban dwellers. The second pattern, deriving from less convincing evidence, points to a possible rising trend in urban fertility. And perhaps another trend, deriving from the second type or consequent upon it, is the commonly observed positive relationship between major modernization variables and fertility which had led to a rising rate of natural increase as one proceeds from the more traditional to the more modern sector. It is suggested that this phenomenon may be related to the better health and environmental conditions to which urban women are exposed compared with women in the smaller localities who do not enjoy the benefits of modern hospitals and clinics, pure water, electricity and modern sanitation. The similarity of fertility of urban and rural dwellers might result from the high fertility of recent in-migrants relative to that of the urban born or in-migrants who have lived in the city for a considerable length of time.

66. Where differential fertility between migrants and non-migrants in the city is observed, it is thought that such a phenomenon may be the result of lack of urban acculturation among recent immigrants who may not enter into the urban social structure in such a manner as to be exposed to forces favouring low fertility. It is also possible that even if the migrants are exposed to an urban environment, the initial tendency is to adjust in a typically rural manner. The existence of rural-based subcultures among recent immigrants in the city may also account for delayed acculturation and the persistence of high fertility among the migrant group in urban areas. On these grounds, the rapid influx of rural-urban migrants is seen as a threat to the stability of the urban social structure by promoting considerable normative disorganization through excessively rapid increase in numbers.

67. With respect to infant mortality, it has been suggested that more effort should be directed at maternal and child health care, preventive medicine, sanitation and education about nutrition and simple personal hygiene. This is the case because the reduction of infant mortality invariably leads to a reduction in the level of fertility as well. With a large number of surviving children, increasing pressure on housing develops along with problems of raising and educating these children. Parents are likely to realize that the size of basic family functions can now be achieved with fewer offspring and traditional norms of childbearing may thus undergo a radical re-evaluation. On the other hand, fertility may also increase following a reduction in widowhood and a prolonged reproductive life. High fertility is also associated with high incidence of infant and child mortality.

68. The foregoing socio-economic correlates of population growth components based on the threshold hypothesis can guide the analyst in ascertaining the desired interrelationships. Additionally, the analyst should note that usually the multiple correlation and regression technique (i) yields the optimum weighting for combining a series of variables in predicting a criterion variable and provides an indication of the accuracy of subsequent predictions; and, (ii) permits analysis of variation (in the criterion variable) into component parts.

69. The typical table of results derived from such usage include zero order and partial correlation coefficients, beta weights, multiple correlation coefficient, the t and F statistics and the standard error of estimate. Consider an additive version of the model such as

$$X^1 = \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \ldots\ldots + \beta_n X_n \quad \ldots\ldots (1)$$

where

X_1= the criterion variable;
X_2= the first independent variable;
X_3= the second independent variable;
X_4= the third independent variable; and,
X_n= the nth independent variable.
β_s= beta weights

Suppose X_1 is derived using say 1985 data (as base year of the plan) while 1995 is the horizon year of the plan period. If in 1995, there exist new estimates of X_2, ... X_n , then from (1) , X_1 can be deduced for 1995 and for that matter, if X_2, X_3 exist for 1995, then X_4 for 1995 can be deduced,etc. A practical problem

here that requires care is whether the beta weights estimated from the model using data for the base year of the plan period (1985 in this case) will still be tenable for the associated horizon year (in this case, 1995). One suggestion is to update the beta weights as more recent data are available.

70. It is just as well to point out that the zero order correlation coefficients are indices of association between the criterion variable and each of the independent variables. Either the partial correlation coefficients or the beta weights are indices for determining which of the several independent variables has the highest association with the criterion. Either can therefore be used as a basis for prioritizing the independent variables in terms of their policy implications vis-a-vis the demographic objectives to be included in the development plan.

71. Equally, either (ie. partial correlation coefficient or beta weights) yields partial elasticities of the dependent variable with respect to the independent variables so that it enables the analyst to hold variables constant and thus come as near as the social scientist is likely to get to the laboratory conditions needed to identify and isolate the role of single variables and hence of single policies. Thus either can be used to estimate the relative cost-effectiveness of alternative population policies.

72. The square of the multiple correlation coefficient is an index of the proportional variance in the criterion variable explained by the combination of the selected independent variables. It provides a test for the relative accuracy of the specified model as well as the adequacy of the selected independent variables in terms of predicting the criterion and hence of the policies that derive from the specified model.

73. The t and F statistics form the basis of testing the statistical significance of the zero order, partial and multiple correlation coefficients. The standard errors of estimate (for zero, partial and multiple correlation coefficient) are indices of assessing the adequacy of the selected independent variables in terms of predicting the criterion.

An illustration with Bongaarts model and proximate determinants

74. Available evidence based on contemporary knowledge indicates that among the socio-economic correlates of fertility decline are reduced infant mortality rate, reduced percentage engaged in agricultural production, a more egalitarian income distribution, increased literacy and urbanization34/. One suggestion for the research agenda of the designated Unit could be to investigate the pertinence of these correlates for the country. To this end, the pertinent data on these and other related variables could be assembled per political unit of the country for which the information is available. The econometric model could be

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34/ Birdsall,N., "Analytical approaches to the relationship of population growth and development", Population and Development Review, vol 3,Nos. 1/2 (March/June 1977).

used to determine the needed socio-economic correlates of fertility levels for the base year of the plan as well as changes over time.

75. Given the constraints of this model in terms of the quality of data used, there will be need for care in interpreting the results and using the later in formulating policies. In particular, although the socio-economic determinants of fertility decline for the country as thus derived may have a broad appeal to policy makers by pinpointing mechanisms susceptible to manipulation by official policy, it is to be stressed that they are problematic in application. Often, the established relationships differ both in magnitude and direction in different settings and at different times. Accordingly, the research agenda might give priority to the proximate determinants of fertility.

76. From the growing literature on correlates of fertility declines, insights can also be gained if in addition to the socio-economic factors influencing fertility thus derived, the specific mechanisms through which these factors operate are identified. Such mechanisms can be deducted from a model developed by Bongaart35/. In symbols, the model states that:

$$TFR = Cm \times Cc \times Ca \times Ci \times TF \quad \ldots\ldots (2)$$

where

TFR is the total fertility rate; C_m is the index of the percentage married; C_c is the index of non-contraception; C_a is the proportion (%) by which fertility is reduced as the consequence of the practice of induced abortions; C_i is the index of lactational infecundability; and, TF is the total fecundity rate (ie. the total natural marital fertility rate in the absence of lactation).

77. The model allows the direction of a fertility level into its proximate determining components. From its application, Bongaart showed that variations in the factors of marriage, contraception, lactation and induced abortion are the primary proximate causes of fertility differences among populations.

78. Thus the model can be used in comparative fertility analysis to determine the intermediate fertility variables (IFVs) responsible for fertility differences among populations or sub-groups within a population. Such analysis is valuable with socio-economic determinants of fertility because the IFVs allow the identification of the paths through which different socio-economic variables affect fertility and hence clarify the relationships between socio-economic indicators and fertility.

79. The model can also be used to trace a change in the fertility level of a population to changes in the IFVs as well as to estimate how much one or a combination of several of the IFVs would have to be modified to obtain a given

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35/ Bongaart,J., "A framework for analyzing the proximate determinants of fertility", Population and Development Review, vol. 4, no.1 (March 1978), pp. 105-132.

reduction in fertility. Such a projection of alternative paths toward a future fertility decline could be of interest to planners and policy-makers.

Derivation of development objectives36/

80. Following the establishment of interrelationships between population and development related data, the second element in the conceptual framework for IPDP is the derivation of the plan objectives. As an illustration of the foregoing suggestions for studying these interrelationships, consider the case of fertility and assume that the designated Unit within the Planning Ministry of a country has reviewed the fertility data for the base year of the plan period and found that (i) its level is high; and, (ii) it is a major determinant of the country's population growth component.

81. Additionally, suppose from the established interrelationships, an analysis of the country data reveals that (i) fertility is significantly inversely related to urbanization, literacy, female age at first marriage and female labour force participation; and, (ii) fertility and infant mortality rate are significantly positively related, then the demographic objectives which are to be included in the plan should take these results into consideration.

82. Development objectives such as reductions in infant mortality and increased urbanization, literacy, female age at first marriage and female labour force participation could be included in the plan consistent with the available resources for implementation. Provided adequate caution is exercised, the general plan objectives and goals could include the promotion of a high quality of life and welfare to all citizens through preventing premature death and illness among high risks groups of mothers and children; and, achieving lower population growth rates through reduction of fertility consistent with the attainment of the nations' economic and social goals.

83. In selecting these objectives use should be made of the general recommendations of the Kilimandjaro Programme of Action on population (KPA37/) in the areas of population and development strategy; fertility and family planning; morbidity and mortality; urbanization and migration; changing role of women in the development process; children and youth; population data collection, analysis ,training, and research; community involvement and role of non-governmental organizations; and, information dissemination.

36/ The development objectives for the Agriculture sector are discussed latter in this section.

37/ See UNECA, KPA , E/ECA/PSD.4/41; E/ECA/PSD.5/42; E/ECA/PSD.6/21, op. cit.; See also UNECA, Kilimandjaro Programme of Action on population (UNECA:Addis Ababa,1984),ST/ECA/POP/1, UNFPA PROJ.NO.RAF/83/P02.

84. It will be recalled that the World Population Plan of Action (WPPA38/) urged countries to consider adopting population policies aimed at achieving a low level of birth and death rates consistent with the goals of reducing the annual growth rate to about 2% by 1985; raising the life expectancy at birth to at least 50 years by 1985; lowering infant mortality rate (IMR) to at most 120 per 1000 live births by 1985; eliminating the undesirable consequences of excessive rural-urban migration; facilitating voluntary international movements; and, taking into account the implications of changing numbers and propositions of youth, working age groups and the aged when formulating policies and programmes.

85. Equally the International Conference on Population (ICP39/) called on countries with high mortality levels to (i) aim for life expectancy at birth of at leat 60 years and infant mortality rate (IMR) of less than 50 per 1000 live births by the year 2000; and (ii) reduce maternal mortality by at least 50% by the year 2000 where such mortality is higher than 100 maternal deaths per 100,000 births. Concerning fertility, the ICP suggests that measures for its reduction should include changing attitudes of the people from large to small size families; expanding and improving female education programmes; improving employment opportunities for women outside the home; introducing or expanding family planning services and facilities; liberalizing laws governing contraceptive availability and use; and increasing the age at marriage. On rural development and urbanization policies, the ICP recommended reducing concentration of population in one or a few urban areas; developing more medium-sized towns; providing social services and amenities in the rural areas; and, providing credit facilities for the rural areas.

Formulation of policies and programmes 40/

86. The population policy formulation aspect usually commences with an analysis of the population dynamics together with an assessment of the implications of such analysis for socio-economic development. These implications are then used to determine the policy goals and objectives. Thereafter appropriate measures are formulated to achieve the latter.

87. Thus the third element in the conceptual framework for IPDP is the derivation of the set of socio-economic and demographic policies for achieving the defined plan objectives. Both demographic and economic policies should be formulated in a comprehensive and integrated manner to produce the desired

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38/ United Nations, Report of the United Nations World Population Conference , 1974: Bucharest, 19-30 August 1974 (United Nations:New York,1975); United Nations, United Nations World Population Conference: Action Taken at Bucharest (United Nations:New York,1974).

39/ United Nations, Report of the International Conference on Population,1984, Mexico City, 6-14 August 1984 (United Nations:New York, 1984).

40/ The policies and programmes for the agriculture sector are discussed latter in this section.

development outcomes. Once the demographic goals, objectives and policy measures of the plan have been so determined, the setting of specific targets for achieving the policy measures should accordingly be carefully handled.

88. The targets to be set during the plan period should take the various recommendations of the KPA, WPPA and ICP noted earlier into account relative to the existing fertility, mortality and migration levels of the country. In principle, the set targets should be realistic in relation to the estimated levels of these components (from the country's data).

89. It is pertinent at this point to reflect on a few principles regarding the setting of targets pursuant to the attainment of the formulated policies and programmes41/. It is suggested that the planner (either general economic or sectoral) should provide the responsible politician with alternative implications of his/her analysis who then would assume responsibility for selecting a set of target(s) for monitoring the implementation of the formulated policies and programmes.

90. In doing so, the politician should note that too many targets could be competitive or even contradictory thus generating uncertainty; hence the fewer the targets, the better. Equally, a consistent series of targets should be selected to clarify the interrelationships between the different parts of the plan as well as to give qualitative expression both to plan objectives and the required resources for their implementation. All the set targets need not be met on annual basis but the trend over a period of years should (i) conform to the set targets; and, (ii) ensure the attainment of desirable changes in the economy. This necessitates periodic revision of the targets consistent with the changing conditions.

91. Targets could take many forms depending on whether the first planning attempts are being addressed (eg. for the agriculture sector: number of irrigation wells to be dug) or more elaborate forms of planning (eg. expected level of demand for agricultural products) or the contribution of the sector to the balance of payments or even issues that cannot be related to planned production (eg. the provision of farm amenities such as water and electricity) are being contemplated. In either case, because both aggregate and individual commodity targets have their merits and demerits, a combination of both is desirable in a development plan.

92. One of the suggested approaches in establishing preliminary targets is the use of (i) an index of the magnitude of a desirable agricultural output (eg. estimated total requirement of agricultural products); (ii) a simple projection of recent trends of output (eg. supply of main crops/livestock products); (iii) some indicator of the interplay of commodity supply/demand trends (eg. a rising trend of imports/real prices for a commodity, a falling trend of exports); (iv) an index of different types of development (eg. data on the agricultural resources or on farm management or cost factors for different parts of the country); (v) 'input programming' (eg. the expected return from large scale

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41/ For details of these principles, see United Nations, Introduction to agricultural planning (FAO : Rome,1970), op. cit. pp. 63-103.

irrigation projects or land settlement due for completion during the plan period); (vi) a type of agricultural development most appropriate for some areas of the country together with associated investment/physical inputs; and, (vii) an index number of agricultural production with component indices of area and productivity42/.

93. Several of these approaches could be combined and a final selection based on an iterative strategy. The task of selecting target approaches should be handled by experts. Equally, it should be followed by setting preliminary targets for the sector (ie. systematically bringing into balance per commodity) the results from current/projected levels of consumption, production, exports and imports). The setting of plan frame are among the most important basic policy decisions in the plan formulation stage. The heart of the matter is to set realistic/attainable targets and thence working backwards to determine how they can be attained within the limits of the available resources. The key to sound and effective planning is thus the establishment of realistic targets.

94. Given formulated policies/programmes and set targets, the implementation aspect of the population policy development process involves the evolution of an action programme for implementing the various population policy measures. Operationally, this 'action plan' constitutes the National Population Programme (NPP). Normally the latter is fairly large, complex, goal-oriented and comprises component sectors, each consisting of projects grouped around a related subset of the population policy objectives,targets and strategies43/. For the programme to be effective, a comprehensive population plan of action is needed. Among other things, the latter should clearly specify the required needs together with the responsible implementation agencies. Two basic approaches can be adopted in designing such a programme.

95. In the first option, each of the component sectors can be designed independently. Usually specialists in the relevant sector both from government and non-government agencies are constituted into a task force to design the sectoral programme. The programme for several sectors may be prepared simultaneously by different task forces per sector or it may be prepared sequentially at different time periods depending on resource and (or) logistical constraints.

96. The separate sector programmes are finally pulled together into what is generally known as the National Population Programme (NPP) with each programme forming a chapter or section of the National Development Plan document. Alternatively, the various sector programmes are issued as individual programmes of the NPP. Usually the latter is the case when the sector programmes are prepared at different times and there exist a need to start implementing each sector programme once it is ready and approved.

42/ Ibid.

43/ Morah, B. C., " Towards designing a comprehensive National Population Programme", National Conference on Zambia's population policy, Lusaka (Zambia), 17 - 18 May 1989.

97. The second option is to constitute a meeting of each of the specialists in the population- related sectors from the government and non-governmental organizations to design the entire NPP as one group at the same time. Initially in this option, all the participants discuss together and agree about the perspective of what is expected per sector; they then break into various specialist sub-groups to work out details of each sector programme. At a subsequent plenary session, the sector programmes are discussed ,modified and consolidated. This ensures that (i) the NPP derives from the input of specialists in other sectors; (ii) linkages between the different sector programmes are established; and , (iii) inconsistencies between sector programmes are streamlined.

98. The NPP then provides a guide to the preparation of the regional programmes. The latter are particularly necessary for very diverse countries with substantial socio-economic regional disparities and with marked cultural differentials as well as a government desire to respond to the specific needs, peculiarities and stages of development per region. Invariably the component sectors of any NPP are a function of the comprehensiveness of the population policy itself and the prevailing conventional wisdom which is to serve as a 'modus operandi' in the formulation of the population policy.

Relationship between macro and sectoral levels of IPDP

99. The foregoing conceptual framework relate to the macro level of IPDP. However, planning in terms of sectors is the only way to comprehend the totality of a nations' economic life. It provides the frame for planning the growth of each sector and through it, that of the entire economy. Unlike macro level planning whose coverage area is conterminous with the political boundaries of a nation, sectoral planning addresses specific development concerns and divides the economy into sectors of economic significance in respect of production and consumption.

100. Basically, the activities of a sectoral ministry in a country tend to relate to particular problems and specific topic studies and are undertaken only when there exist a pressing problem to be solved. To some extent therefore, every country possesses some data needed for sectoral analysis. Successful planning requires the translation of nationwide objectives and policies into the specific requirements of individual sectors and sub-sectors as well as into the still more specific details of individual projects44/.

101. Sometimes, this process of translation is either not done properly or is not done at all because the staff of the Central Planning Agency of the country and those in sectoral ministries may not communicate adequately with each other. Accordingly, the typical development programme moves forward with weak connections between "the top" and "the bottom".

44/ Baum, W. and Tolbert,S.M., Investing in development (Oxford University Press,1985),chapter 5

102. A basic purpose of sector analysis is, therefore, to bridge the gap between the macroeconomics of the country-level policies and investment programmes and the micro-economics of individual projects. It promotes "top down" and "bottom up" activities in several ways. First, it complements macroeconomic work by analyzing the effects of the sector, and on projects within the sector, of such general policy variables as the exchange rate, tax structure, wage policies and interest rates. Second, sector analysis provides estimates of output and employment potential and investment requirements for the sector as a whole; these are essential inputs into the central planning agency's decision regarding the national investment program and priorities.

103. By assessing the development potential and the relative advantages of different projects and programs, sector analysis helps to ensure that individual projects are selected and designed on the basis of a sector's needs and principles, and that policy and institutional changes necessary for good performance of the project, or microeconomic level are identified. Because no sector functions in isolation from the rest of the economy, an important contribution of sector analysis is to determine the impact of a sector on the development of other sectors and to ensure consistency in policy and investment recommendations from one sector to another.

104. Thus sector analysis is concerned with the examination and assessment of the resources, needs, problems and opportunities in the individual sectors of the economy with the aims of developing sector wide policies and strategies that will enhance the contribution of the sector to the country's economic development; determining investment priorities in the sector as a crucial step towards identifying specific projects; and, evaluating the capacity of principal institutions in the sector to implement desired policies, programmes and projects.

105. There are problems with sector analysis. It demands substantial manpower and other resources for long periods, as well as high-level commitment. It also demands a great deal of information. Sector agencies often do not have the necessary mix of technical, economic, financial, and other skilled staff for sector studies; if they do, they find it difficult to spare them from other duties. Furthermore, within many traditional ministries, a variety of organizational, procedural, and bureaucratic impediments to co-ordination interfere with the establishment and effective working of programming units.

106. Conceptually, the same three necessary elements for macro-economic planning of studying interrelationships; deriving development objectives; and, formulating policy measures and programmes together with associated targets are also applicable in sectoral planning. In this regard, what is significant for the IPDP process is that the various identified sectoral policies and programmes per plan period should be assembled by a designated unit within the Planning Machinery (eg. the Macro-economic Section of the Ministry of Planning) and thence prioritized. The final list of policies and programmes selected should be feasible in terms of implementation (ie. in relation to available resources)

simultaneous with being consistent in addressing the incidence of poverty, unemployment and inequality in the nation during the plan period45/.

107. In this context, the main difference between the conceptual framework for the macro and sectoral levels of planning is that the data, research techniques and models used (per sector) in determining the interrelationships as well as the associated demographic objectives, policies and programmes have to be sector specific. For instance, consider the agricultural sector.

Basic elements of agricultural sector planning (ASA)

(i) The problem areas of agriculture in relation to population

108. Demand is the dynamic factor in agricultural sector planning; it stimulates agricultural productivity and production. The factors determining this demand are however, exogenous to the sector. On the other hand, supply is conditioned by the biological/seasonal nature of the sector besides the facts that farmers are scattered in small units; and, many of them only produce for their home consumption. Given these and other difficulties, agricultural planning should start with a study of the sector46/. This should be followed by sector planning, regional development planning, policy studies, project preparation and project monitoring.

Sector studies

109. Sector studies are crucial for IPDP because they orient subsequent plans/policies and offer many opportunities to identify population-related issues in agricultural development as well as possible linkages between agricultural and population policies. These studies (i) assess the state of the sector and its supply potential; (ii) project future demands; (iii) analyze production factors in depth; and, (iv) examine interlinkages between population and various activities within the sector as well as between the sector and the rest of the economy.

110. Operationally, such a study should provide the government with an overview of the sector; assist in deciding on allocation of national resources; clarify the consequences of policy alternatives; indicate how changes in the sector might affect the rest of the economy; and, generate ideas on new investment area as well as the relative priority of different initiatives.

111. The logical outcome of sector studies should be projections of food demand based on econometric functions under hypotheses regarding income growth. Alternative population projections (especially variants differing by the speed

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45/ Todaro,M., Economic development in third world countries (McGraw Hill,1985).

46/ United Nations, Planning agriculture (FAO: Rome,1984).

of urbanization) should be tried to assess the sensitivity of food needs to different courses of demographic events.

Sector Planning

112. Sector studies are particularly useful when translated into action through a sector plan which then fixes production objectives for the sector within the framework of national development goals by (i) setting realistic targets for all major parts of the sector over the medium/long term periods; and, (ii) determining requirements for technical and financial aid. To be effective, a sector plan should set out priority investment programmes and projects together with organizational arrangements for their implementation.

113. Like sector studies, sector planning requires data on the resources and trends of production in the sector. These should include number/composition of agricultural production units; volume and value of agricultural commodities; the population engaged in agriculture; agricultural income and expenditures; consumption of agricultural commodities; and, the relationship between agriculture and the rest of the economy (eg. % of GDP due to agriculture; % of (exports-imports) based on agriculture; % of the agriculture to total population).

114. A major source of these data should be the agricultural censuses which, among other things, should collect data on number of agricultural holdings (and their characteristics); area under crops (and volume of production for main crops); number of livestock (and volume of production of some livestock products); numbers of persons (and characteristics) employed in agriculture; number of agricultural machines owned (and their use); irrigation (and drainage); use of fertilizers; food and fishery products obtained from agricultural holdings; and, association of agriculture with other sectors. To have value, this physical stocktaking should be accompanied by a thorough appraisal of current and future productivity of these resources; this calls for appraisal of agricultural resources.

115. An agricultural resource appraisal should start with an assessment of the limitations for land use due to its physical characteristics. This should indicate the laws that would respond with sufficient economic returns to the application of improved production techniques and investment of appropriate operating and improvement capital (better seeds, fertilizer, irrigation and drainage). It should also show the geographic location of areas where farmers should be provided with the market price and credit conditions that are necessary for the expansion of the volume and efficiency of agricultural production.

116. In the absence of basic statistics - broad assumptions should be made about the resources on the available evidence. Such estimates should as much as possible be based on a number of years (due to weather conditions). Given this inventory, the magnitude and change of current agricultural trends should be determined in order to decide the direction which the plan should attempt to alter.

Regional Development Planning (RDP)

117. Thus far with sector studies/planning. The implementation of sector plans often entails RDP. This includes improvement of health services, water supplies, education facilities. It requires multi-disciplinary analysis. Regional planning is needed to promote more balanced development within the country; its foci include issues of spatial location of activities, distances, transportation and communication networks. Accordingly, the setting of regional development objectives should be based on an examination of the needs and strategies of the local population. In terms of IPDP, regional strategies regarding the utilization of production factors (labour and land use) and technology issues in agriculture should be studied. Some of these issues are pertinent here.

118. Based on the foregoing considerations and in the light of an FAO study, it was reported that fourteen out of forty Sub-Saharan African countries did not have enough land (assuming subsistence level farming) to support on a sustainable basis, a population as large as that estimated for 1975[47]/. In terms of the destruction and degradation of the resource base on which depend agriculture and many related sectors, the study stresses that the main causes are (i) the over exploitation of land due to inappropriate cropping practices (e.g. the use of steep slopes and marginal land for arable farming as well as excessive reduction of fallow periods); (ii) the overgrazing of rangelands by livestock populations; (iii) the deforestation of wooded areas caused by clearing for agriculture, felling for timber, shortening fallow periods under shifting cultivation, the gathering of fuelwood and the increased occurrence of fires; and, (iv) poor water management systems and the increasing salinity and alkalinity of irrigated soils.

119. The expansion of further land for cultivation is constrained in many parts of the region because of such diseases as river blindness and sleeping sickness (e.g. Sudan). Any large expansion of agricultural production requires some form of irrigation. Shortage of surface or underground water in many parts of the region (e.g. the Nile Basin) is a constraint to irrigation development. Poor water management is considered to be the most important single constraint to irrigated crop production. Multiple cropping (i.e. more than one crop a year from the same piece of land) is a typical way to cope with rising populations. Farm studies in the region show that, on average, a 10 per cent increase in farming intensity involves a 3 to 4 per cent increase in the amount of labour per hectare. Labour input per hectare increases because, under intensive farming systems, the extra hours required for land preparation, sowing, weeding and plant protection more than offset the reduction of hours-essentially for land clearing-associated with shorter fallow periods.

120. Consequent upon these and other constraints, African agriculture has, for more than two decades, been experiencing a crisis in which per capita food production has fallen by nearly 20 per cent since 1961; food imports have been

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47/ World Bank, World development Report,1984 (The World Bank:OUP,1984), chap 8 Box 8.4; See also UNECA, Demographic Handbook for Africa, 1982 (UNECA: Addis Ababa, 1984), chap. 6.

increasing; and, African economies have been under enormous stress48/. Among these other constraints affecting African agricultural productivity are governments' policies of taxing farmers while subsidizing consumers thus increasing dependence upon imported food; frequent change in policies due to changes in government; low rate for agriculture; inefficient human resources and lack of spare parts for needed machinery49/.

121. In particular, there exist a gap in African countries between the rates of food production and of population growth due either to the setting of wrong targets or to the planning models that were carried over from colonial heritage. Such models have tended to be labour saving, irrelevant and injurious to the countries in terms of food shortages and unemployment in the post colonial socio-economic situations.

122. In effect, according to the FAO study, the main causes of the crisis include a bias against agriculture in the policy of many African governments; high population growth rates; decline in the rate at which arable land and harvested area are being developed; a lack of technological change leading to widespread stagnation or even decline in crop yields; accelerated degradation of the environment; and an external economic environment that is making it more and more difficult for most African countries to balance their budgets.

123. In addition, there is the recurrent problem of the lack of effective linkage between research being undertaken in the universities and ministerial institutes of the member States and extension. This is the very bane of African agricultural development. The problem is that often the extension establishments have no access to research results due largely to lack of co-ordination. In some cases, even where such access is feasible, the extension may not have the needed human resources for implementation. A related problem area is marketing which can be reasonably considered as part of the chain of extension services. It has been suggested that to achieve self-sufficiency in food production, both the production and marketing aspects of the surplus produce should be clearly spelt out in order to give incentive to agricultural labour.

124. Although the countries must farm, the forest should be conserved because they play a crucial role in the ecosystem; they prevent erosion; they generate oxygen; and they influence climate. Finally, there is need to consider not only food distribution in the country but also inter-regional food production. They should also address issues of food security and storage in terms of providing for the lean years; provide more land for agriculture; motivate farmers through more favourable prices; quantify the role of women in the agricultural sector; stabilize the supply systems during the plan periods; and, focus on strategies which can lower fertility levels in relation to food production.

48/ United Nations, African agriculture: the next 25 years (FAO: Rome, 1986).

49/ For details see Are, L., "Agricultural policies and development: what went wrong ? 1980-85 (Nigeria)", Development Outlook,vol.1, No.1 (June 1986).

(ii) Development objectives in agriculture

125. From the FAO study under reference and in the light of the aforementioned constraints, the main options open to African governments in terms of providing solutions to the current agricultural crisis should be land irrigation development; increasing land and labour productivity with available technology; and, developing additional technology to overcome production constraints. In operational terms, these options imply creating favourable terms of trade; strengthening rural financing; fostering markets for traditional staples, and increasing the supply of consumer goods. There is a need for a reorientation of the colonial policies so as to concentrate the new strategies on the available resources of population, land and other natural resources. The planning techniques to be adopted should focus on self-sustained development based on these resources.

126. In addition, the suggested changes should be implemented within an overall strategy aimed at sustained growth. Radical changes should be made to the external economic environment. Countries should not continue to cope with the rising cost of debt service and the destabilizing effect of fluctuations in agricultural export revenues. Both donors and recipients would have to make further commitments to one another in future development programmes.

127. Despite the decline in the proportions of the agricultural labour force, the size of that labour force continues to grow in the face of the rapid population growth rate in the countries. In order to absorb this growing labour force into productive employment in the course of development, the need is to improve the efficiency and labour absorption capacity of the rural sector. In this regard, the specific variables that should be considered in agricultural planning include the available physical resources (land, water, soils, etc.) trends in agriculture production (imports, exports, inputs, producer prices, etc.), investment in agriculture, demand and supply situations, rural urban workers and taxes, and targets of other sectors of the economy.

(iii) Policies and programmes for the agriculture sector

128. In order to overcome the aforementioned constraints and ensure self-reliance and self sufficiency in the food production of the most affected countries in the region within the framework of the agricultural crisis, it is suggested that in the short term (the next five years), African governments should focus attention on programmes that will quickly improve the food supply situation namely storage, processing, transportation, distribution and marketing of agricultural produce as well as the provision of certified seeds for all farmers.

129. Regarding storage, it is known that as farmers in most of the countries produce more food, more of it is lost to weeds, insects, birds, rodents, fungi bacteria and viruses both in the field and during the post-harvest stages. Governments should adopt a strategy of reducing food losses as a means of increasing food availability. To arrest the high storage losses, bulk storage

and drying devices should be installed. In this regard the commercial banks should be encouraged to extend as a priority, their soft loans for agriculture. The establishment of factories for the processing of raw perishable agricultural produce will increase the total available food, give added value to the products, provide employment opportunities for more people, assist in establishing the price of essential food items as well as keep food quality high.

130. A short strategy is for the countries to define the food problem as it exists (e.g. malnutrition, under-nourishment and food deficiencies); determine their pattern and level of food consumption relative to standard food intake on nutritional needs as well as their "target consumption levels and the total food tonnage required; define policies on food production and distribution in relation to the disadvantaged areas and socio-economic groups; and, develop a data base on population size, age-sex structure, rural-urban distribution, food intake and state of nutrition; food supplies, production, imports, and ecological areas.

131. On the provision of basic infrastructure such as transportation, distribution and marketing of agricultural produce, it should be admitted that sustained agricultural development requires striking an appropriate balance between investment that are directly productive and investments in infrastructure. Improved rural roads bring traders, truckers, and officials to villages and help encourage health and education personnel to live there and enable villagers to travel to markets and elsewhere. The lack of marketing opportunities can act as a powerful disincentive to farmers; improving marketing systems can be as important as introducing farming methods that increase yields.

132. Besides these short term strategies, it is suggested that over the long run governments should consider the provisions of infrastructure and social amenities in the rural areas, making large investment in agriculture, and preparing land resources map. Only with the provision of land use maps would the governments have a precise knowledge of the soils and be in a position to recommend appropriate fertilizers at adequate levels to the farmers. In the provision of these infrastructure, the farmers should be involved in the decisions regarding, for example, which roads and dams to construct. This would enable them feel that these structure belong to them as well as encourage them to participate in their construction under the guidance of technical experts; this would reduce costs.

133. In order to achieve the targets set in sector, sub-sector and regional development plans, a wise selection of policies should be designed to (i) induce maximum returns with the utmost economy in the use of scarce resources; and, (ii) improve access to inputs such as seeds, pesticides and fertilizers. Although population considerations do not assume a prominent place in policy analysis, some policy studies require appropriate knowledge on specific aspects of population dynamics and 'households' behaviour and hence call for the integration of some socio-economic demographic variables. For instance, manpower policies aimed at ensuring an adequate supply information on labour force participation by sex, age, sector, space and time.

134. Equally, input supply policies for small-scale farmers should take into account the availability of family labour for input application. Price policies

require adequate knowledge on farmers' reactions to price changes given the structure of their needs and market access. Food security policies should consider how population change may affect security factors in the working of the food supply system. As a rule, agrarian policies should address issues that are linked to the effects of population growth (and possibly migration) on tenure and land ownership patterns when assessing problems50/.

135. Ultimately, the success of any plan depends on whether it can be implemented. Project preparation should begin with identification of a potential project; the latter should be investigated in a feasibility study. This study should define the project objectives and the best approach to achieving them. Operationally, the identification of a problem requiring intervention often arises from the perception that the actual situation diverges from what is desirable and that such condition could persist (or even deteriorate) unless active interventions are implemented. Project planning requires that such a target problem be clearly specified in terms of the size/location of its target population; this enhances determination of project objectives (in terms of impact).

136. Among the several approaches that can and should be used to identify and estimate the size of the target population are the (i) key informant approach; (ii) community forum approach; (iii) statistical indicators approach; and, (iv) census/survey approach51/. The first of these involves asking knowledgeable persons in the community to assess the existence of a particular problem and to identify/estimate the target population involved. Often, this approach yields incomplete and biased information. The second approach obtains information from community members usually gathered for the purpose of discussing community problems that may require external support and intervention to resolve.

137. With respect to the third approach, economic and social indicators on selected areas of concern based on past censuses or surveys are also useful in estimating the size of the target population; however, such indicators may be outdated or may not be available at the community and social groups level. The most accurate (but expensive) data source on target population are special sample surveys/censuses of communities. In practice, therefore, a combination of the four approaches should be used.

138. Overall, three population-related issues are of concern to the agricultural planner at project preparation stage. The first pertains to structural issues within the agricultural labour force and their implications for the organization of production and technological options. The second is the lack of social (and demographic) homogeneity of local populations with differential labour and land use strategies by social group (and type of families). The third pertains to possible impacts of projects and programmes (under study) on population and labour force dynamics including differential effects by social group or type of families.

50/ Marcoux, A., op.cit.

51/ Rossi,P.H. and Freeman,H.E., Evaluation: a systematic approach (Beverly Hills: Sage Publications,1982).

139. On these bases, population variables should be considered during project preparation. In particular, during project identification, the analysis of demographic situations can help detect problem areas through such indicators as out-migration rates, distorted labour force structures and high population/arable land ratios. During feasibility studies, labour availability should be assessed with care. In overall project design, problems linked to social differentiation should be taken (eg. the varying resources and social/economic interests of various groups) into account. Demographic factors should be integrated in project design to allow for the future dynamics of families and land holdings52/.

140. At the implementation stage, the project can be viewed from the levels of inputs, outputs and effects. There should be an overall evaluation of the plan at regular intervals, based on detailed progress reports. The follow-up needed to obtain the information for evaluation requires the setting up of machinery at the national and local levels. Planners should visit the projects from time to time to see the situation on the ground. Evaluation helps to secure better formulation of projects and thus avoids waste by drawing attention to causes of development and permitting the identification of measures needed in order to accelerate the execution of the plan.

141. Based on the questionnaire53/ developed and used by the ECA Secretariat to monitor the implementation of the United Nations Programme of Action for African Economic Recovery and Development (UN-PAAERD) and on the aforementioned three desiderata of development efforts, some of the agricultural policy options in contemporary African development planning can be regrouped into those that are aimed at eliminating and/or minimising agricultural sector (i) poverty; (ii) unemployment; and, (iii) income inequality.

142. From the said questionnaire, the policy options that might be aimed at eliminating and/or minimising agricultural sector poverty and income inequality include (i) raising substantially the level of investment in agriculture; (ii) increased food production; (iii) restoring, protecting and developing arable land and rendering it more productive; (iv) improving and expanding the storage capacity, distribution and the marketing system; (v) the establishment of remunerative produce pricing policies; (vi) the establishment and strengthening of incentive schemes, eliminating pricing policies that have tended to discourage production and providing effective agriculture credit programmes; and, (vii) increased use of fertilizers, improved seeds and pesticides.

143. Regarding eliminating and/or minimising the incidence of agricultural sector unemployment, the policy options might include (i) the development of agricultural research and extension through the creation of a network of agronomical research stations and extension for the design and diffusion of appropriate agricultural technologies; (ii) the establishment of assistance programmes for small farmers especially women, food producers and rural youth; and, (iii) the improvement of the distribution of products.

52/ Marcoux,A., (1989), op.cit.

53/ The policy options in the development planning of the agricultural sector in ECA member states derive from a questionnaire prepared and used by the ECA Secretariat to monitor the implementation of UNPAARED.

144. This grouping of policy options are only indicative. Actual country experiences would defer to some extent. What is important in this context, is that to the extent possible, the population development interrelationships being established per sector (or at least at the macro level) should aim at evolving sectoral (or macro level) development objectives and thence policies and programmes that are tailored towards addressing the three desiderata of development efforts.

145. In the balance of this section, (i) the CAPPA system, used to derive these agricultural policies, is outlined and, (ii) the remaining constituents of IPDP are presented.

CAPPA, a model for Agricultural Sector Analysis (ASA)54/.

146. Agricultural sector analysis (ASA) generally, comprises a set of tools used in describing, projecting and evaluating the characteristics, potentialities and performances of agricultural sector in a country55/. Its objective is to capture the interaction of private and public decisions pertaining to different regions, institutional or technical sub-sectors, resources and markets in the country. General models have been developed and used in ASA; the most common being linear programming. Additionally, econometrical estimated models, systems dynamics, simulation models and general equilibrium models have been used. However, these various approaches have not fared well in practice.

147. This led to the development of non formalized sector analysis. The first major effort in this direction was the Indicative World Plan (1965-85); a study of all regions in the world-based on country level data conducted during 1962-70. This study laid the foundation for a series of wide ranging analytical tools for ASA including Food Balance Sheets, Supply Utilization Accounts and Demand Projection Models. These 'Country Perspective Studies' (CPS) had a 10-15 years horizon and were based on the scenario approach.

148. A second major step in the development of non-formalized sector analysis was the standardization of the methodology of the CPS and extension of the 96 countries-based study to 'Agriculture Towards 2000' (ie. AT2000)56/.

149. Essentially the CPS involved (i) the examination of the overall economic situation and outlook; (ii) the formulation of development objectives for the agricultural sector; and, (iii) the translation of such general objectives into production and trade targets. The goal was to assess the conditions and policies under which realistic output targets could ensure an acceptable balance between

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54/ The analysis in this part of the section derives largely from the 'direct' contributions of the FAO Economic and Social Policy Department staff particularly Messrs Allain Marcoux and J. Vercueil. For instance, Figure 1 was prepared by Mr. Vercueil.

55/ Vercueil, J. (1989), op.cit.

56/ United Nations, Planning Agriculture, (FAO: Rome, 1984), op. cit.

production, domestic absorption and foreign trade for each commodity (or commodity group). Operationally this involved examination of the technical potentialities ; assessment of the system of prices and economic incentives that would help transform potentialities into effective achievements; and, ensuring that domestic demand was met.

150. In practice, the CPS was an iterative process which made successive assumptions, variations and adjustments until possible targets were set for production and thence elaborates on the policy measures and actions required to support their implementation (i.e. the target). The linear scheme involved the preparing the macro economic framework; setting objectives for the agricultural sector; examining agricultural potentialities; setting sub-sectoral targets; and, designing implementation measures.

The tasks and structure of CAPPA

151. The construction and examination of scenarios appear as major concerns for applied methodology developments in ASA. This is the task of the CAPPA system developed by FAO with UNFPA assistance as a logical follow-up of the earlier studies just noted on agricultural perspective studies and training programmes for agricultural planners addressing the population aspects of rural development.

152. In effect, experience in the latter field had shown that one of the obstacles to the integration of population dimensions in planning studies is the lack of readily available instruments for planners to implement that integration in a structured way. Accordingly, when in 1984, FAO undertook to adapt for use at the country level, the projection model which had been used for the Agriculture: Towards 2000 study, it decided to expand the latter methodology to include population, labour force and nutrition dimensions. CAPPA is the result of that effort.

153. Overall, CAPPA facilitates the operationalization of the various elements of agricultural sector planning by reducing them into simple computer modules. Specifically, it enables agricultural planners to (i) institutionalize population and labour force projections in their tasks; (ii) assess the effects of various policies on labour requirements, employment, agricultural production, income and foreign exchange; (iii) consider the links between the sector's performance and rural-urban migration; and, (iv) perform nutritional analysis. In the context of this Manual, CAPPA is used to derive investment and employment policies required for ASA.

154. CAPPA is designed to facilitate the construction of scenarios for the agricultural sector. A scenario is a set of projections that simulate the evolution of key variables for the agricultural sector (food demand and trade, cultivated areas, yields, cropping intensities, labour utilization, etc.) and for its environment (population, micro-economy, etc.), over a specified period of time (usually including or corresponding to the next plan period).

155. The scenario approach to planning is one valuable tool for ASA; its rationale is that the analysis and comparison of alternative scenarios of

agricultural development enable planners to asses the feasibility of alternative strategies as well as the implications, for the whole sector, of alternative hypothesis on key variables or external courses of events during the planning period, thus providing a more solid basis for decision making.

156. It is important to stress here the fact that in developing scenarios, the agricultural planner may work either in (i) a 'projection' or 'requirements' mode. Regarding the 'projections mode', the planner starts with numerical assumptions about population and national income growth parameters, growth of agricultural resource base parameters as well as parameters for the growth of agricultural productivity, by product and land class.

157. These assumptions form the inputs of a given scenario; the system then displays their consequences for agricultural production, consumption, foreign trade. Because these consequences might not be consistent with the desired ones, the planner has the option of experimenting with different sets of assumptions.

158. Regarding the 'requirements mode', the planner defines a desired future level of agricultural production (or say of agricultural balance of payments) and then uses the CAPPA system to derive a set of supply and demand parameters that are sufficient to ensure that the targets are met. In this mode, the challenge for policy planning is to determine whether those values of supply and demand parameters are feasible and if so, how to induce them through policy changes.

159. One other difference between the two modes of the CAPPA system is that in the 'requirements mode', an important set of parameters is the ratio of domestic production to total supply (ie. self sufficiency ratio) for each product. These are fixed (for future periods) in the CAPPA system. The required expansion of arable land and improvement in yields are then found through the CAPPA analysis. On the other hand, in the 'projection mode', the self sufficiency parameters are determined residually consequent upon projected yields, cultivated land and the demand side parameters. In the ANNEX, only the 'operation mode' is used in explaining CAPPA's potential for the scenario building process in ASA (using CAPPA's Ghanaian data base for illustration).

160. "The typical use of CAPPA consists in projecting internal demand for agricultural products (food products and raw materials for industry) as a result of population growth and modifications in the macro-economic setting. Then, while taking into account external trade objectives and other utilizations (seed, feed, waste), the production targets which should be satisfied by agricultural supply, can be determined. The consideration of various alternative policies for population and the macro economic aggregates, lead to the determination of a range for the agricultural production targets. The objective of the projection and analysis of supply is then to explore whether the agriculture sector can achieve these targets, identify the major constraints and priorities and give an outline of the type of strategies and policies needed under different circumstances"57/.

57/ Vercueil, J., " Setting targets for agricultural planning" (FAO: Rome, 1989), op. cit.

161. Structurally, the CAPPA system consists of a set of computer programmes, a standard data base for individual countries; and, a manual with associated documentation. The data requirements of CAPPA are largely those which an agricultural planner normally works with (eg. availability of arable land by major land type; amount of product lost in the course of processing and marketing (ie waste)). The specific data requirements per CAPPA module are indicated under the discussion of the module. These data and much of the system's definitional structure (eg. categories of land types of end use for products, etc.) derive from the FAO's AT 2000 exercise.

162. To date CAPPA data bases have been created for 32 of the 51 ECA member States including Morocco, Sudan and Tunisia (Northern sub-region); Burkina Faso, Cote D'Ivoire, Ghana, Guinea, Liberia, Mauritania, Niger, Nigeria, Senegal, Sierra Leone and Togo (Western sub-region); Angola, Cameroon, Central African Republic, Chad, Congo, Gabon and Zaire (Eastern Sub-region); Burundi, Kenya, Madagascar, Malawi, Mozambique, Rwanda, Somalia, Tanzania, Uganda, Zambia and Zimbabwe (Eastern sub-region).

163. These base year data are necessarily specific to each country. However in any application, the planner has to provide his/her data by modifying the data base inputs. This task is not easy. In this respect therefore, one contribution of the CAPPA system is to provide policy analysts with a list of the data required for projection exercises.

164. In content, CAPPA comprises three phases with a total of 10 modules. As indicated in the ANNEX, the first comprises 4 modules : CAPPOP (Population projections); CAPMAC (macro-economic projections); CAPDEM (Domestic demand projections); and, CAPSUA (Supply Utilization Accounts). This last module sets the provisional production targets. In the second phase, a production scheme is prepared so as to meet the production targets thus set in phase one. This phase comprises 3 modules : CAPVGT (Analyses crop production); CAPANM (analyses animal production); and, CAPFAC (analyses technical factors of production). Investment and employment implications of the sector are analyzed in the third phase which comprises 3 modules : CAPLAB (labour force analysis); CAPECO (economic analysis); and, CAPNUT (analysis of nutritional situation). In using the CAPPA system (see the ANNEX), the order of these modules should be maintained.

165. In practice, a scenario construction goes through the following steps - (i) projecting population and the labour force; (ii) projecting macro-economic variables including private consumption expenditure; (iii) projecting food and non-food demand; (iv) setting domestic production and international trade targets; (v) studying land allocation and agricultural intensification patterns in the light of crop production targets; (vi) studying stock growth and exploitation patterns in the light of animal production targets; and, examining the implications of the above in terms of (vii) input consumption; (viii) labour utilization; (ix) economic results; and, (x) nutritional results. Together these ten steps (corresponding to the 10 CAPPA modules) constitute the complete population analysis in CAPPA as depicted diagrammatically in Figure 1.

166. It is obvious from Figure 1 that CAPPA contains a detailed population module, performing total and urban/rural population projections, and total and agricultural/non-agricultural labour force projections. United Nations and ILO

projections are available for reference purposes in the module and can be used as a basis for scenario building. International and rural-urban migrations are explicit in the model. Labour force is projected by sex and age groups. Numerous demographic indicators are displayed, as well as graphs (population and labour force pyramids).

167. The labour utilization module enables the system to compare labour demand and supply and to examine the sex and age composition of the latter, the seasonal distribution of labour demand, and the compared impacts of area extension versus agricultural intensification on labour demand.

168. The nutrition module permits the calculation of nutritional requirements as a function of the sex and age composition of the population, and their comparison with nutrient supply implicit in the food demand pattern. Attention is called upon population variables as appropriate in the other modules.

169. The primary utilization of CAPPA should be training planners in the use of the scenario approach in planning studies. In so doing, attention is naturally directed to the multidisciplinary nature of agricultural planning; in particular, the relevance of population variables is shown in highly practical terms.

170. Training can be organized in a fashion that places emphasis on those variables and shows that they can be treated either as exogenous, or as justifying an empirical endogenization, or yet as target variables. For instance, international migration can be considered in any of those three ways depending on the country and the circumstances.

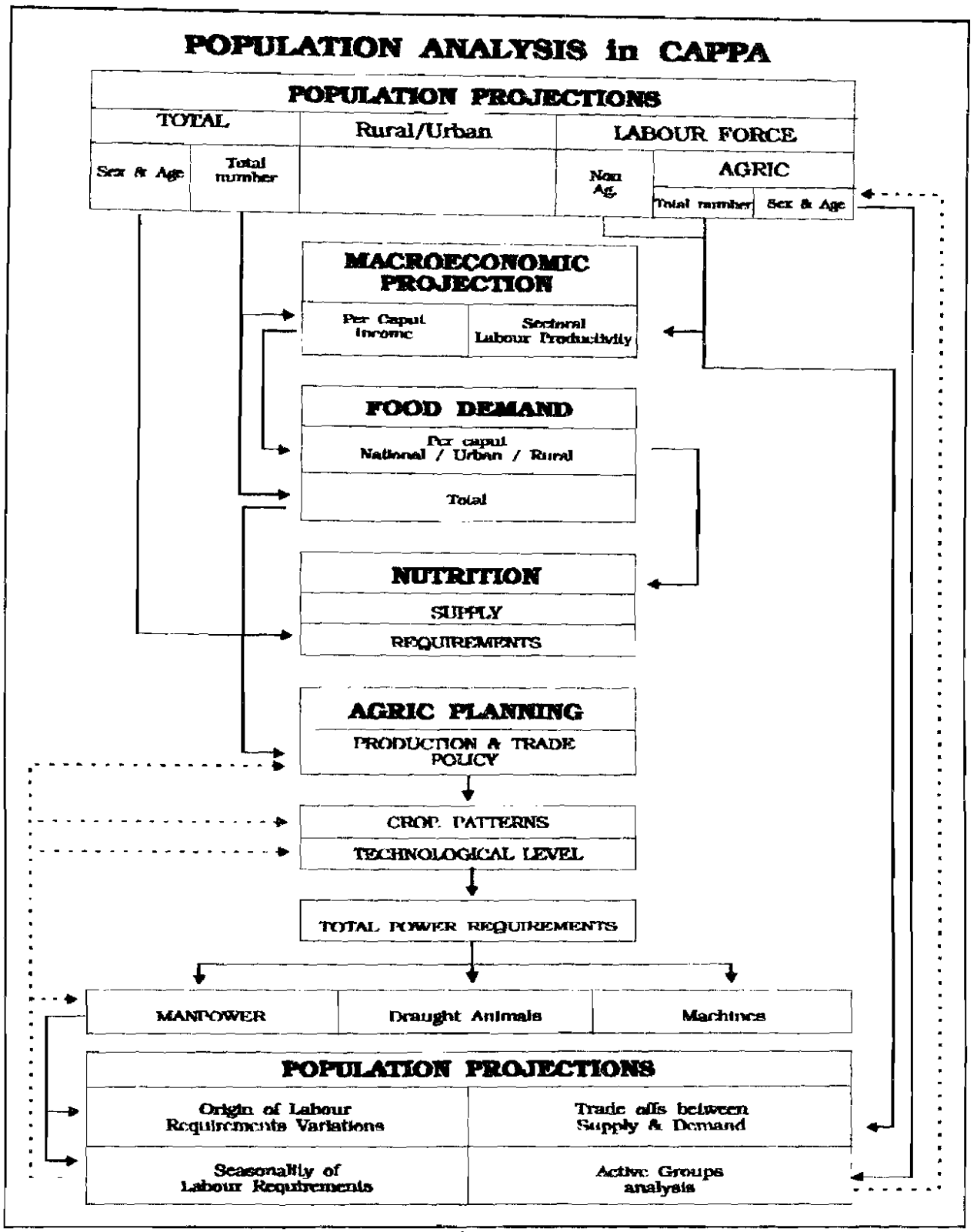
POPULATION ANALYSIS in CAPPA
POPULATION PROJECTIONS
TOTAL
Rural/Urban
LABOUR FORCE
Sex & Age
Total number
Non Ag.
AGRIC
Total number
Sex & Age
MACROECONOMIC PROJECTION
Per Caput Income
Sectoral Labour Productivity
FOOD DEMAND
Per caput National / Urban / Rural
Total
NUTRITION
SUPPLY
REQUIREMENTS
AGRIC PLANNING
PRODUCTION & TRADE POLICY
CROP PATTERNS
TECHNOLOGICAL LEVEL
TOTAL POWER REQUIREMENTS
MANPOWER
Draught Animals
Machines
POPULATION PROJECTIONS
Origin of Labour Requirements Variations
Trade offs between Supply & Demand
Seasonality of Labour Requirements
Active Groups analysis

Figure 1

171. Fertility and mortality will most likely be generally considered as exogenous; rural-urban migration, being affected by agricultural labour demand-supply disequilibria, rural-urban income differentials, or agricultural land-labour ratio, could well be adjusted depending on scenario results in terms of these indicators; and the size of agricultural labour force could be taken as an objective.

172. However, CAPPA can equally well be used for concrete planning applications (and is indeed requested by countries mostly for this purpose). It can be used to simulate the impact of alternative population trends (with respect to population growth rates, or to urbanization), on food demand patterns or labour supply for instance. Finally, in planning applications the system by its very structure constantly reminds its users of the role of population variables. And since calculations are taken care of by the programme, users fill more free to explore the role of those variables through sensitivity analyses based on the construction of multiple variants.

The limitations of CAPPA (as a model ?)

173. Although CAPPA is thus a useful planning tool, it has some limitations. First, it cannot be used to analyze choices in output pricing policy because it does not incorporate the price responsiveness of demand and supply58/. Secondly, it is not a project evaluation tool because it does not incorporate specific investment projects. Finally, it does not contain input prices of specific instruments of macroeconomic policy (eg. taxes and tariffs, exchange rates and credit allocations/subsidies). To the extent that its consistent requirements can be expressed as equations, the CAPPA system is a model. But since it does not have a clear distinction between variables and parameters, it is not strictly a model. At best therefore, CAPPA can be regarded as a 'projection system'.

174. From the explanations and illustrations in the ANNEX, CAPPA is basically a demand driven projections system59/. The balance sheet generated in the CAPMAC module is the starting point where, given demand (from population and income in CAPPOP), the trade objectives are laid down to derive the production targets. The subsequent work involves working out the production scheme to meet the production target. Most of the effort of the agricultural planner is spent on preparing the production scheme.

175. The solution of a single scenario is obtained through a series of iterations with alternative land location and yield levels until the initial vector target outputs, or an alternative one close to the original, is produced.

58/ All projections are conducted in constant base year prices.

59/ Chandan Mukherjee (1989), "Agricultural planning with specific reference to CAPPA", International Symposium on population and development planning, Riga, Latvian SSR, 4-8 December,1989.

The problem is that because this is time consuming, CAPPA is not particularly suitable for short term training purposes.

176. CAPPA is not a 'model' of a the agricultural sector in the usual sense of the word (ie. a set of formalized relationships that describe the behaviour of certain variables as a function of other variables). CAPPA essentially is a set of accounting relationships (eg. area x yield is equal to output), with the exception of food demand functions, which are based on income elasticities. Those relationships are structured into subsystems (CAPPA's modules), each of which serves to build a particular component of the scenario: labour force projection, crop production perspective, etc.).

177. By contrast with accounting identities, behaviourial relationships between variables are not supplied by the system; they must be estimated by the users on the basis of their knowledge and judgement. CAPPA is not, therefore, an optimization system that would supply ready answers to policy problems (such as the optimal allocation of investment resources), but a simulation system that enables users to expeditiously conduct projections and calculation of indicators, and therefore, to easily build and compare a much greater number of alternative scenarios than would be possible in the absence of ad hoc software.

II-(ii): INSTITUTION BUILDING FOR IPDP

178. The foregoing activities (macro and agricultural sector levels) necessarily raise the question of who does what ? In this context a starting point in population policy development is to ensure political commitment. Once a Government is convinced of the need to take action about the population, it usually designates a leading Ministry to co-ordinate the various activities that are involved. From the available evidence, the indication is for the National Population Commission (NPC) to select a 'lead Ministry' with responsibility for co-ordinating activities related to the formulation of the policy.

179. As indicated below, the NPC then sets up the Population and Planning Unit (PPU) and Data/Policy Units for policy formulation. Subsequently, a Multisectoral Committee is also set up for policy implementation. However, it should be stressed that the NPC-PPU-Data/Policy arrangement is not the only possible structure and the desirable 'set-up' for IPDP can differ from country to country; data analysis for policy formulation can also be organized in various ways besides the establishment of task forces.

Role of the National Population Commission (NPC)

180. In principle, the NPC is a high-level political body chaired by a member of the Cabinet with membership from the line ministries, other governmental and non-governmental organizations, etc. The extent to which the commission is involved will depend on its political mandate and the commitment

of the government to a population policy. The degree of political unity of the ministries is another important factor: rivalries between ministries may be an obstacle to IPDP.

181. An ILO evaluation Report of UNFPA support to population and development planning in Sub-Saharan African region has observed that in most cases, the NPC does not perform a genuine political role in population policy formulation60/. In some cases, it is merely a formal meeting of political figures who get together once a year to discuss population issues and adopt wide-ranging resolutions with little or no impact on actual population policy. The report observes further that in most cases, the Population Commission has no genuine political mandate to set policy guidelines which would have a concrete impact on operational population programmes.

182. Although the extent to which policy at the level of the NPC can be translated into operational programmes depends on the extent to which its activities and recommendations are backed up at the technical and administrative levels, the formation of the NPC is neither a reflection of the Governments' commitment nor an effective means to translate guidelines or recommendations into actual policy. However, the ILO Report under reference observes that the NPC can, under the right circumstances, become an instrument of policy formulation.

183. The experience of Rwanda is a case in point. Rwanda's particular circumstances with regard to population policy stem in part from the political urgency to reduce the fertility rate as well as the Government's commitment to population policy from the outset. The Government set up a Scientific Consultative Council on socio-demographic problems. The Council recommended the creation of an autonomous body (l'Office National pour la Population or simply ONAPO) with the mandate to undertake technical, analytical and evaluation functions as well as carry out operational programmes in the areas of family planning, population education, sensitization and training. Whereas ONAPO's mandate was defined at the technical and operational levels, its authority, the prestige of its Director as a political figure and its relative and budgetary autonomy created the required institutional conditions for the formulation of a population policy despite the fact that it was not granted an explicit political mandate to formulate policy.

184. In other words, policy formulation, operational and technical functions are internalized within a high ranking autonomous Governmental body. It is the integration of these functions in an autonomous institutional structure rather than the existence of a formal population commission that constitute, in the case of Rwanda, the main ingredients of success of population policy development.

60/ Lucas, D.; Pool,I.; Tabah,L.; Chossudovsky,M.; Cole, S.; and, Mubiala,L., "Comparative evaluation of UNFPA support to population and development planning in Sub-Saharan Africa region: A Preliminary Regional Report" (ILO:Geneva, February 1988).

Role of the Population Planning (PPU)

185. Aside from the NPC, another component of the Institutional structure for policy development is the PPU. Since the PPU provides the technical, analytical and research expertise in support of the policy formulation process at the political level as well as technical input to sectoral planning, a few cautionary remarks are pertinent here.

186. To the extent that the institutional location varies from one country to another depending upon the importance attributed to population policy by the Government as well as the mandate of the PPU, it is pertinent to indicate the relative merits and/or demerits of locating the PPU in either the Ministry of Planning or Health.

187. The position and power of the Ministry of Planning in the overall Government structure will have an effect on the extent to which population policy is actually carried out. However, the location of the PPU in the Ministry of Planning does not in itself necessarily ensure the integration of population variables into development planning nor the enhancement of population issues in overall development policy.

188. In many countries, the Ministry of Planning, while responsible for setting priorities in the National Development Plan, has very little influence on the budget process and the allocation of expenditure to competing social and economic objectives. In this case, the Ministry of planning prepares the national development plan and performs technical functions in support of economic and social policy formulation. The Ministry of planning also serves as a co-ordinating unit in relation to other ministries. Often it occupies an important position in the negotiation and co-ordination of technical co-operation by bilateral and multilateral donors. This ensures the incorporation of population issues into the sector plans of the ministries by favouring a better co-ordination of the actions of individual donors into an overall technical co-operation programme in the population development field.

189. Alternatively the PPU may be confined to the Central Statistical Office (within the Ministry of Planning) where it is entrusted largely with the task of compiling and analyzing population data. On balance, this location does not favour the development of policy oriented research and planning functions by the PPU although it may serve the useful purpose of reinforcing the demographic data base in the Central Statistical Office.

190. In Senegal, Mali and Cameroon, the PPU is located in the Human Resources Division of the Ministry of Planning. In Sierra Leone, it is located in the Central Planning Unit of the Ministry of Planning which appeared to constitute a key location. These various experiences suggest that on balance, it is better to have the PPU located in the Central Planning Unit of the Ministry rather than in the Human Resources Directorate in view of the Central Planning Unit's functions as a body responsible for integration.

191. On the other hand, in countries where the PPU is located in the Ministry of Health (e.g., Nigeria and Rwanda), the main thrust of

population policy tends to be in the area of family planning. In this case, data collection, analysis and policy related research will be supportive of the Ministry's family planning programme integrated into the delivery of MCH care through the hospitals and rural health centres. Despite the emphasis on family planning, the location of the PPU in the Ministry of Health does not preclude the development of institutional relations with other ministries as well as the development of an integrated population policy in as much as the PPU has some degree of autonomy as well as the ability to address population issues from a broader multivariate perspective.

192. In Rwanda the PPU is located in ONAPO which is an autonomous body attached to the Ministry of Public Health and Social Affairs. Although it is responsible for the implementation of Rwanda's family planning programme. ONAPO also addresses, as part of its mandate the central issues of economic, social and population policy. In this context, the policy of food self-sufficiency is central to the formulation of population policy. Other issues include education, migration patterns, employment, women's welfare, urbanization and human settlements.

193. The objective of integration requires an institutional framework which supports communication and interaction between the PPU and the ministries. Other things being equal, institutional interaction is more likely to unfold when the PPU is staffed by a core inter-disciplinary team of professionals combining the expertise of demographers with other disciplines. In other words, the articulation of methodologies of population development integration and the development of a population problematic at the level of the core team tends to encourage the development of institutional linkages.

194. It is suggested that where the PPU is located in the Ministry of Health, some autonomy in relation to the Ministry is required to ensure that population-development integration is carried out through the establishment of linkages with other Ministries. Such an autonomy (in Rwanda) was an important factor in ensuring that population issues were addressed from a broad socio-economic perspective.

195. The studies, research and analysis section of ONAPO in Rwanda perform specific technical functions in support of its operational programmes as well as through institutional linkages with the line ministries. The nature of the research conducted by the ONAPO team in the study of scenarios involving interaction of demographic factors with an understanding of such areas as agricultural development, migration, employment and the provision of health and educational services has contributed to the forging of institutional linkages as well as the promotion of an active debate on population-development policy.

196. The experience of Rwanda seems to confirm that the location of the unit in the Ministry of Health has not been an obstacle to integration and the establishment of institutional linkages with other ministries. Wide-ranging institutional linkages both with the ministries and non-governmental organizations have been established. This has been facilitated by the semi-autonomous and high level status of ONAPO.

197. In Nigeria, a more or less similar arrangement without the same political cloud however has been established with the creation within the Ministry of Health of the Office of co-ordination and implementation of population programmes. Under this arrangement the responsibility for integrating population variables into development planning is assumed by the population desk of the Ministry of Finance and Economic Development.

198. In Zimbabwe the linkages with ministries were largely based on the role and mandate of the Central Statistical Office (where the PPU is located) as a body responsible to meet the statistical data requirements of the ministries. The underlying linkages in this case, tend to be confined to the tasks of data compilation and analysis on behalf of the ministries. In this case, the institutional location in the Central Statistical Office combined with the absence of integrated population-development research by the unit represent important constraining factors to the development of institutional linkages in support of population policy formulation.

199. In addition to the coordinating and research functions for the PPU, it should have the task of providing guidelines to the sectoral ministries (in this case the Ministry of Agriculture) to enable the latter identify its problem areas to be tackled in the course of a particular plan period; to ensure that its development objectives to be attained in the course of the plan period derive from the identified problem areas (ie. the sectoral population development interrelationships); that the policies and programmes of the sector for the plan period are geared towards realizing the identified development objectives simultaneous with being in line with the overall government priorities for a given plan period as well as within the limits of the available resources for the implementation of the overall plan strategies.

200. This necessitates the use of sector specific data, research methodology and models to ascertain the interrelationships between the sector population on the one hand and economic development related factors on the other hand. The established interrelationships should then be used to determine sector objectives, policies and programmes.

201. The main objective of the coordinating and research roles of the PPU is to enable it to select the policy instruments. The outcome of the analysis of these problem areas, objectives, goals, targets and policy measures should be well disseminated among the various sectors of the population in order to enlist the needed support for the policy. The creation of awareness is thus a vital step in the policy development process.

202. In this regard, the ongoing practice is for the PPU to take steps to educate the general public and 'responsible' government officials about the raison d'etre of the policy. Side by side or prior to these publicity, the PPU usually commissions a body to draft the policy to indicate the evidence (i.e., the problem areas per sector, the goals/objectives and targets to be achieved as well as the policy measures and programmes in lieu of the defined goals/objectives and set targets). This is the ideal conceptual framework and is aimed at ensuring that the evidence presented reflects the outcome of a thorough analysis of the country's data on population-development interrelationships using pertinent models to ascertain the associated

socio-economic correlates and/or proximate determinants of the population growth components; this can thus be manipulated by policy in the course of plan implementation.

The Data Unit

203. The Data Unit should ensure that the various ministries and other institutions identify their data requirements (collection, processing, analysis and utilization in planning).To do this, it should identify planning units within the sectoral ministries and research institutions and establish appropriate functional linkages (between them) at the national, subnational and local government levels. Additionally, the Data Unit should (a) assess anticipated needs for population data through continuous reviews of available data sources, producers,users and means of access; (b) determine priorities for data collection and utilization; and, (c) be responsible for the collection, analysis and use of population development related data required for IPDP.

Multi-sectoral Committee

204. After a formal promulgation of the formulated population policy as well as putting in place, an 'Action Plan' for its implementation, a Multisectoral Committee (MSCPPI) should be constituted to operationalize the 'Action Plan'. The MSCPPI should comprise senior level technicians from related sectoral ministries (and agencies) responsible for population development related programmes. Under the direction of the NPC and in collaboration with the PPU, the MSCPPI should be responsible for IPDP by functioning as the 'implementation arm' for the population policy. In this regard, its technical arm or Policy Unit should prepare a synthesis of completed population development research indicating their policy relevance and disseminate the later information to planners in the various sectors.Additionally, the Policy Unit should (a) identify, develop and manage research through establishing data bases for IPDP; and, (b) provide training (through workshops, seminars, and conferences) in techniques of IPDP.

205. In sum, the MSCPPI should provide a mechanism for assisting the PPU in monitoring programme implementation through information feedback on programme experience, assessment of programme impact, provision of needed statistical data generated within the Ministries; assessment and interpretation of research findings; influencing research fund allocation within the public and private sectors.

II-(iii): TRAINING FOR IPDP

206. The third activity in the process of IPDP should be to constitute the training programme required to bridge the gap in the manpower situation of the nation needed to implement the first two sets of activities. A programme of training is definitely needed to support the implementation of the activities outlined thus far regarding the integration process. The content and scope of the training programme will depend on the size, background and experience of the existing staff working in development planning (within the country).

207. The main training programme should be aimed at providing better understanding of the linkages between socio-economic processes and population dynamics. It should aim at developing capabilities for understanding interrelationships between population and development as well as creating a core group of national and regional trainers for integrated planning. Three main components of the programme should comprise middle level training, formal courses, and sensitization for policy makers and planners (eg. Parliamentarians).

II-(iv): INFORMATION DISSEMINATION FOR IPDP

208. A fourth activity should be the dissemination of information thus far generated by the integration process. Success in IPDP depends upon creating an awareness of demographic problems at different levels of decision making. Consideration should therefore be given to the establishment of a national focal point to coordinate the collation of dissemination of information on population and development planning.

209. Such a focal point could consider the publication of a technical journal devoted to research findings in the country on a recurrent basis and to the country experiences on population- development interrelationships, important conferences and seminars, and the status of national as well as international projects dealing with population and development planning.

ANNEX

BASIC OPERATIONAL STEPS IN CAPPA'S SCENARIO BUILDING PROCESS.

210. To use the system, a mini computer is required (specifically IBM PC-like computers) together with the installation of (i) the 10 programmes stored on a Diskette (CAPROG); and, (ii) the other programmes, auxiliary files and the data base stored on a Diskette (CAPRUN). In a Technical Manual the step by step procedure of using these inputs to create a scenario is provided61/. The attempt here is to take the user through the scenario creation process (as contained in the indicated version of the Technical Manual).

211. A typical feature of the system is the large scope that it gives the user (planner) to define the assumptions on which the projections are made. In this respect, three aspects should be stressed. First, the user has to provide the value of some variable or parameter otherwise the operation of the system cannot be continued. This explains why the system provides the user with the option of formulating the assumptions in several ways (eg. a growth rate, elasticity, incremental/average ratio). Secondly, the system also enables the user to choose among sets of data already available (and provided by International Organizations). Finally, the system displays a default projection which the user can then modify.

Phase One: Setting the initial production targets

212. Having installed a CAPPA system, a session is started by entering the key KP. This command immediately presents

DISPLAY ONE:

YOU ARE STARTING A CAPPA SESSION (data base 1983). DO YOU WANT TO:

(N) : BUILD A NEW SCENARIO
(C) : CONTINUE AN UNFINISHED SCENARIO
(V) : CREATE A VARIANT OF AN EXISTING SCENARIO
(X) : LINK UP TO AN EXISTING SCENARIO
(E) : DELETE AN EXISTING SCENARIO
(L) : LIST THE EXISTING SCENARIO

213. In principle any of the 6 options in DISPLAY ONE can be selected. However, if the first option (N) is selected, the user is requested to provide (i) the

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61/ Vercueil,J., Technical description of the CAPPA system (United Nations FAO: Rome ,31 July, 1985), W/R7273. Mimeographed, op. cit.

name of the scenario; (ii) the name of the Diskette for storage of results of scenario; and, (iii) the horizon year.

214. For the present purpose, the scenario will be named GHANA (because the CAPPA data base for Ghana is being used as an illustration); the PC-DRIVE to store the results of the scenario will be "A"; and, the horizon year will be 1988 (with 1983 as the base year).

215. At this point, the user has to validate the choice of a scenario by pressing the key "CONTROL V". Automatically, the system then displays the main menu (DISPLAY TWO). Following is a brief description of what the first module (CAPPOP) does together with an illustration with the Ghanaian CAPPA data base.

[Population projections with CAPPOP]

216. CAPPOP enables the planner to undertake an investigation on the relevance of demographic projections in agricultural sector planning. It prepares the total population at the horizon year (T); the corresponding labour force projection (L); and, the corresponding rural population projection (R); this is optional62/.

217. Total population is used mainly in domestic food demand analysis and for all per caput calculations through a given scenario. It is projected by the United Nations "Components Method". The planner may either define his or her own set of assumptions regarding the future levels of the determinants of population growth (fertility, mortality and external migration) or simply use the parameters of the United Nations projections. To guide the planner at this point, it is the "high Variant' of the United Nations projections that is used as default projection and hence is what is incorporated in the data base for any one of the desired CAPPA country data bases.

218. It will be assumed that the user is familiar with the mechanics of the United Nations Component Method for projecting a country's total population. However, for the unfamiliar user who may wish to simply use the population data provided in the data base for a particular country, following is an outline of the components method as a guide.

219. Basically, the method involves (i) the use of the base year estimates of population growth components (fertility,mortality and migration) to define a projection matrix (M) of size n x n (where n= number of one or five year age groups in the base year total population; (ii) using M as a linear operator to operate on a column vector, K (where K = the base year age-sex distribution of

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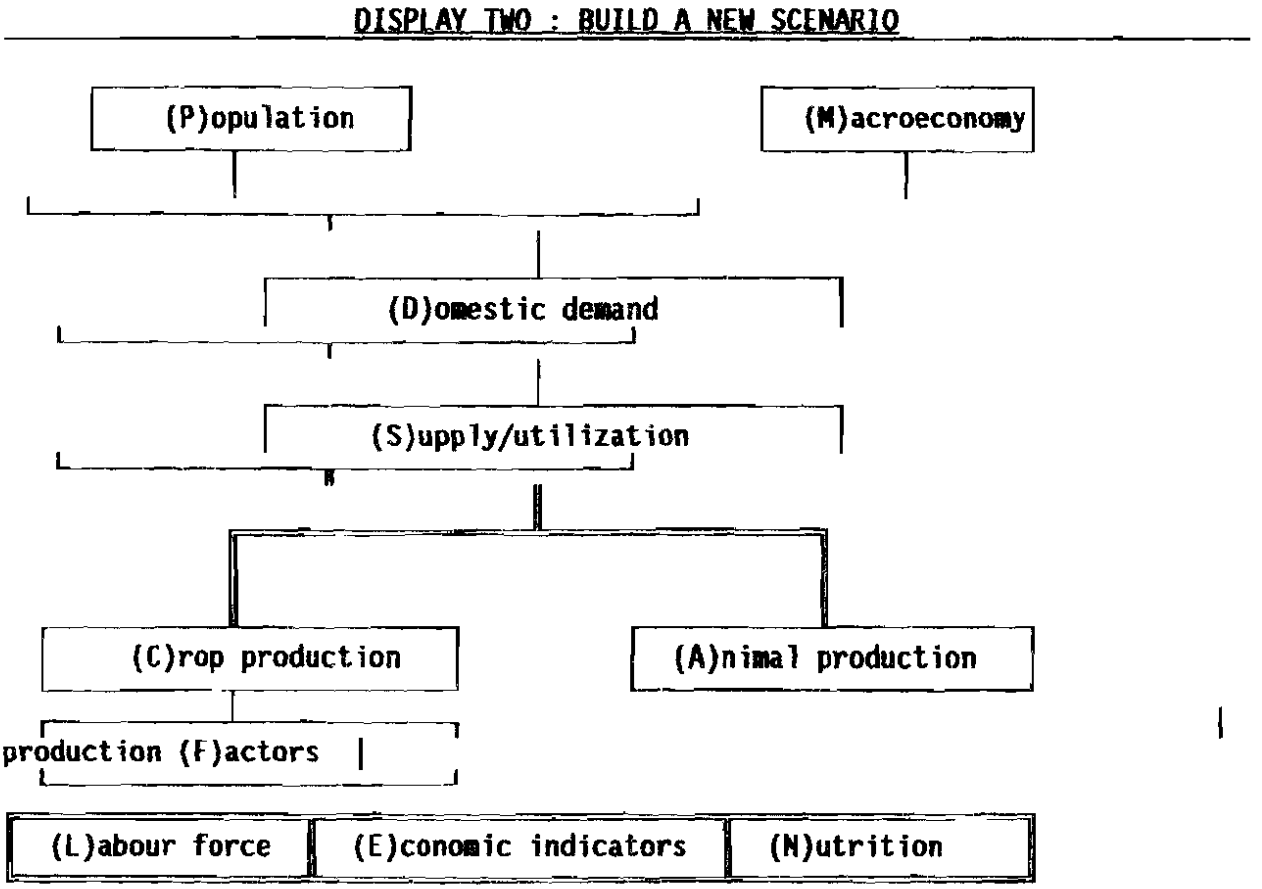
62/ The specified data input requirement for the CAPPOP module comprises (i) total population projections (life expectancy M and F); gross reproduction rate)); (ii) international migration (average migratory flow per year by age/sex); (iii) active population projection (activity rate by age/sex); (iv) projection of agricultural/non-agricultural population (growth rate by age/sex); and, (v) rural population differential projection (urban/rural growth rate by age/sex, internal migration).

the total population); and, (iii) repeating the operation throughout the desired projection period simultaneous with changing the elements of M when and as desired in the process.

220. In practice, the projection process implies that the initial numbers of base year total population by age-sex are multiplied by assumed survival rates in successive future periods in order to obtain the numbers of survivors in each future year (or groups of 5 years). The projected numbers of females in the productive ages are multiplied by the assumed age-specific fertility rates in order to derive the births. The total of the latter is distributed by sex using an assumed sex ratio at birth. In turn, the latter is multiplied by appropriate survival rates to obtain the survivors at the end of each year (or 5-year periods). The assumed net balance of migration is added (or subtracted) to (or from) the projected population by age-sex in each future year or 5-year period. This procedure is repeated for each year (or 5-year period) throughout the projection span.



221. In symbols, the process (for one year)63/ can be expressed as follows:

$$_{x+1}S^{t+1} = [\ {}_xS^t\ ][\ {}_xP^t\ ] \pm B^t \quad \ldots\ldots\ (2)$$

where

${}_xS^t$ = number of males or females aged x in year t;

${}_{x+1}S^{t+1}$ = projected number, one year older, one year later;

${}_xP^t$ = survival rate; and,

B^t = net balance of migration.

$$_0S^{t+1} = [\ {}_{15}F^{49}\ ][\ \tfrac{1}{2}\ [\ {}_xS^t + {}_xS^{t+1}\ ]][\ D\ {}_nP^t\ ] \ \ldots\ (3)$$

where

${}_0S^{t+1}$ = No. of boys or girls aged under 1 yr. in yr. t+1

${}_{15}F^{49}$ = ASFRs for ages 15-19, 20-24, ... , 45-49;

${}_xS^t$ = No. of females in year t;

${}_xS^{t+1}$ = No. of females in year t+1;

D = ratio of male or females among total births;

${}_nP^t$ = ratio of survivors at end of year during year

222. The next problem for the user is the future assumptions of the population growth components. Projections of mortality, fertility and migration for developing countries are commonly subsumed within the demographic transition theory. The United Nations components method makes provision for several socio-economic models to accommodate varying paths of mortality and fertility; the user has to select among these64/. Sometimes a country's projections may be modelled after another country's experience that might be more advanced in the

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63/ The CAPPA system proceeds by 5-year leaps.

64/For details of the selection procedure, see Report of the Regional Training Workshop on demographic estimates and projections held in Accra (Ghana) from July 15 through 29,1985,vol. 1, (UNECA: Addis Ababa,1986), op.cit., pp.227-275.

demographic transition process. At other times, the user's intuitive judgement might be utilized. What is required is respect for each epoch and each population.

223. Using the Ghana CAPPA data base (with 1983 as the base year) as an illustration, once the user has proceeded as far as DISPLAY TWO, he/she simply interacts in a friendly manner with the SYSTEM, responding and providing the assumptions as required65/.

224. For the projection of the total population, the CAPPOP menu comprises three options namely to (i) display UN projections (U); to display reference projections (R); and, to build demographic projections (P).

225. In the event of the user opting for (iii) but using the UN components method, the system would require (in addition to total population by age-sex),base year estimates of life expectancy by sex (ie. an index of mortality) and of gross reproduction rate (ie. an index of fertility). It will be assumed in the case of Ghana that external migration is insignificant.

226. At this point the user can provide these estimates depending on the data available. The Ghana data base refers to 1983 (ie. before the 1984 population census). It is possible that new data sets have since become available. For the Manual, the estimates for Ghana (1983) are life expectancy at birth of 53.2 (males), 54.92 (females) and a GRR of 3.2. The associated total base year population is 6,229,100 (males) and 6,442,600 (females) giving a total of 12,741,700.

227. Using the basic steps of the component's method as outlined above, the CAPPOP module then generates (i) the total population (1988) by 5-year age sex groups (0-4, 5-9,..,75-79,80+) both in absolute figures and in a graphic form (population pyramids)66/; (ii) the corresponding per cent distribution; (iii) the trend indicators (ie. total population, per cent growth rate of population (1983-88), index of total population, median age, dependency ratio and child woman ratio); and, (iv) the base/horizon year period indicators (ie. growth rate (%), average annual growth, average birth rate, average mortality rate, general fertility rate (all per 1000), average annual migration (constant) and migration rate (%).

228. The second step in CAPPOP is the projection of agricultural labour force, the key element in dependency and productivity analyses as well as in the analysis of employment. As for the total population, the planner has three options: to display ILO or reference projections (D) or to execute labour force projections (P).

65/ The user is advised to study the Technical Manual carefully alongside with using this Manual for ASA.

66/ For instance, the total population for 1988 is projected as 7,465,000 (males), 7,561,000 (females) giving a total of 15,026,000;

229. In case the ILO rates for 1983 (derived from the total population) are used. The projected population figures from the component method are applied to the ILO's participation rates by age-sex in order to obtain the labour force projections. These rates are supplied for each quinquennial leap as for the ILO assumptions both for the base and horizon years of the scenario. The share of agriculture in the total labour force is projected using the FAO method which assumes a logistic growth path of the non-agricultural labour force67/.

230. It should be noted however, that while the method employed by the LATIN AMERICAN DEMOGRAPHIC CENTRE (ie. CELADE) assumes constant participation rates (obtained from the latest population census for the country), the ILO method used in the CAPPA system assumes that the effect of the determinants of the participation rates is regular and evolves in parallel to the degree of a country's development as measured by the proportion of the male labour force in agriculture.

231. The third step in CAPPOP is the projection of the rural urban population. A decomposition of the total and labour force projections by rural-urban categories is useful in demand analysis as well as in linking internal migration to employment analyses. The base year population by age-sex; the labour force participation rates; the share of agricultural workers in the active population; and, of rural in total population are read (by the system) from the data base (ie. the reference scenario : UN, ILO and FAO hypotheses are used as default). The projection method assumes a logistic growth of the urban share of the population. It is also assumed that over the 1983-88 period the net internal migration (net balance between urban and rural areas) was equally negligible as for the external migration68/.

67/ It is important for the user to know that the United Nations Family in this regard is particular about ensuring consistency in the preparation of these projections (ie. total by the UN Population Division (New York in liaison with the Regional Commissions), labour force by ILO, educational by UNESCO, agriculture by FAO, etc.). By implication, the strategy currently used is that the total population projections are used by each of the specialized Agencies as inputs for preparing their sector specific projections. The overall coordination of these activities is currently under the umbrella of the UN Population Division (New York). The World Bank, US Bureau of the census, WHO, UNIDO, etc are presently members of the Task Force that coordinates the activities involved.

68/ Subsequently, the total population derived from CAPPOP is used (i) in CAPMAC and CAPDEM for the macro-economic and domestic food demand projections respectively; (ii) its break down by age-sex is used in CAPDEM for the nutritional analysis; (iii) the rural and urban breakdown is used in CAPDEM for the rural and urban food demand projections; (iv) the agricultural and non-agricultural labour force is used in CAPMAC to compute sectoral productivity; and, (v) agricultural labour force by age-sex is used in CAPLAB to compare with labour requirements for agriculture.

[Macro-economic projections: CAPMAC]

232. Having completed the population projections, the next step is the macro-economic projections [ie. (M) in DISPLAY TWO]. The CAPMAC module prepares macroeconomic projections for the horizon year of the scenario69/. All the macro-economic inputs (ie. GDP : total, agricultural and non-agricultural; public investment; exports; imports; and, private consumption) as are available from base year estimates.

233. By definition, at the macro level,

$$Y + M = C + G + I + X \quad \ldots\ldots\ldots\ldots \quad (4)$$

where

Y = the GDP;

M = imports;

C = Private consumption expenditure (PCE)

G = Government consumption expenditure (GCE);

I = Investment (ie gross capital formation);

X = Exports.

234. Of the six items in (4), once five of them can be derived, the 6th can be deduced. In the CAPMAC module, a particular sequence of projecting the

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69/ For the CAPMAC module, the specified data input requirement comprise (i) GDP growth rate (%) of agricultural GDP; growth rate (%) of non agricultural GDP; or growth rate (%) of total GDP (factor cost); ratio (taxes-subsidies)/GDP (at factor cost). (ii) Gross capital formation - ratio of investment/GDP (%) or incremental capital output ratio. (iii) Government consumption expenditure growth rate (%) or average rate of government expenditure/GDP (%) or marginal ratio of government consumption/GDP (%); (iv) Exports growth rate (%); or elasticity of GDP (absolute); (v) Imports growth rate (%) or elasticity of GDP (absolute); (vi) Private consumption expenditures total growth rate (%) or growth rate per person or marginal propensity to save; (vii) Surplus or Deficit average ratio to GDP (%) or export/import cover ratio (%) or savings/investment ratio (%) or GDP value at the horizon year (if deficit). elasticity of GDP (absolute);

amount of investment required to sustain the assumed amount of GDP; project government consumption; project growth of exports; and, define the growth of M or C.

235. There is only one menu in CAPMAC namely either to display existing projection (D) or to build a new projection (P). As indicated in the Technical Manual, (D) simply displays tables, indicators and parameters. With (P), six interactive data input are requested of the planner namely (i) GDP; (ii) investment; (iii) government expenditure; (iv) exports; (v) imports; and (vi) private consumption.

236. Upon entering the key M from DISPLAY TWO, the system displays a simplified macro-economic table (see Table 2) for the base year (in this case, 1983). The user is expected to define in turn the GDP (GT, GA, GNA), government consumption expenditure, investment and exports. Then private consumption and investment are computed under the constraint that total resources equal total expenditures. In the balance of this section, the principles underlying what the user should do in all six cases are discussed.

The GDP

237. For agricultural sector planning, three components of the GDP should be projected viz total (GT); agricultural (GA); and, non-agricultural (GNA). In symbols, **GT = GA + GNA .....(5).** To obtain future projections of all three GDP components, stock should be taken of past achievements in the country in the recent past by examining available time series data for GT, GA and GNA. The future assumptions should be a continuation of these observed trends.

238. Since the experiences of countries differ markedly, a suitable method used to obtain GDP estimates with respect to one country may not be adequate for another. Therefore, there is need for care and value judgement before arriving at a suitable method to use.

239. As an illustration, consider the case of Ghana with the time series data in Table 1. If the user wishes to determine an estimate of the GDP as a requirement of the CAPMAC module, one possibility is to fit a trend line (using first principles) to the data in Table 1. The data reveal that both the GT and GA generally increased over the 1975-80 period, declined during 1980-83 and thence increased during the 1984-87 period. In the case of GNA, there was a decline from 1975 through 1983 and thence an increase through 1987.

240. First consider the series GT; apparently, the 1975-87 trend appears non-linear. A simple sketch of the GT time series (see Fig. 1) suggests a bimodal distribution with an inverted parabola for the 1975-83 segment followed by a simple parabola for the 1983-87 segment. This makes it difficult to fit a unique non-linear curve (eg. the familiar exponential function of the form):

$$Y(t) = A\,(B)^{x(t)} \quad ..... \quad (6)$$

241. Available evidence indicates that although Ghana was involved with 'stand by arrangements' of structural adjustment programmes (SAPs) of the World Bank since 1966, it only received World Bank structural adjustment loan in 1986. Analytically therefore, the 1975-83 period appears to coincide with the pre-SAPs period while the 1983-87 period corresponds with the post-SAPs period.

242. Given this information about the GT series and assuming a constant growth rate in the GDP, a geometric function can be fitted to the GT series over the 1983-87 period; the derived growth rate can then be used to obtain the GT value for the horizon year. In symbols,

$$Y(t_1) = [1 + g]^{t1-t0} [Y(t_0)] \quad \ldots\ldots\ldots \quad (7)$$

where

$Y(t_1)$ = GDP (component) at time t_1

$Y(t_0)$ = GDP (component) at time t_0

g = the annual growth rate (%) of the GDP component.

From (5), $g = [Y[t_1] \div Y[t_0]]^{1\div(t1-t0)} - 1$ .. (8)

243. In the case of the GT series: $Y[t^1] = 113$; $Y[t^0] = 90$;

and $[t^1 - t^0] = 4$ (ie. 1987-1983). By substituting these values

in (5), g = 5.85 %. For the GA series, g = 3.30 %;and, for GNA,

g = 8.78 %.

244. In the case of the GDP whose base of the assumptions for the 1983-88 period has just been outlined, it should be stressed that the initial GDP projection (eg. GT = 5.85 %; GA = 3.3 % and GNA = 8.78 %) is preliminary and may be revised at the end of the completed scenario. At this point the SYSTEM requests the user to provide two out of three growth rates (%) of the GDP (total, agricultural and non-agricultural). This has just been illustrated in the case of Ghana. Upon providing the estimates for GA and GNA, the system immediately computes the GT value. The user notes that this value of 6.18 % deviates slightly from the 5.85 % derived earlier.

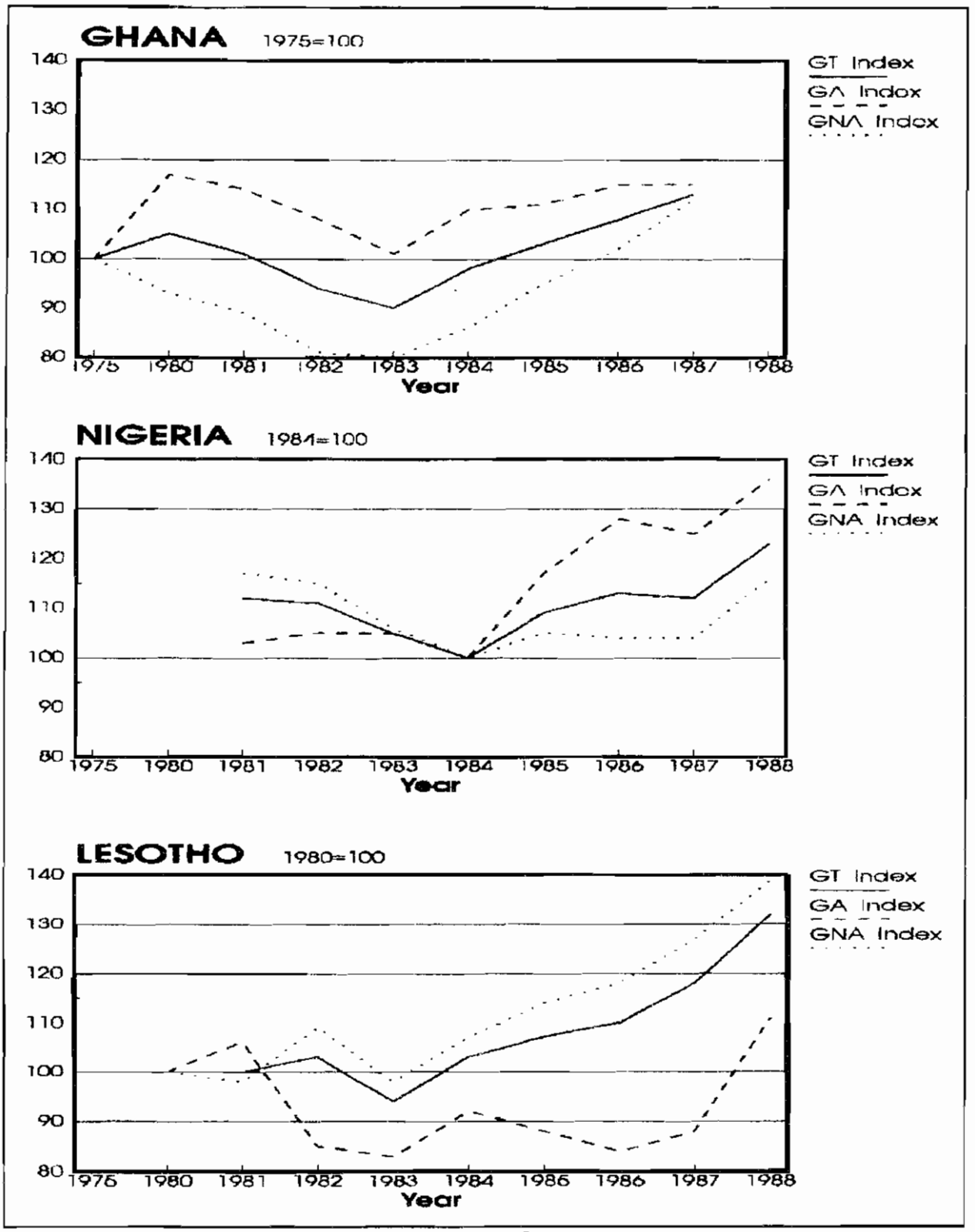
GHANA
1975=100
140
130
120
110
100
90
80
1975
1980
1981
1982
1983
1984
1985
1986
1987
1988
Year
GT Index
GA Index
GNA Index
NIGERIA
1984=100
140
130
120
110
100
90
80
1975
1980
1981
1982
1983
1984
1985
1986
1987
1988
Year
GT Index
GA Index
GNA Index
LESOTHO
1980=100
140
130
120
110
100
90
80
1975
1980
1981
1982
1983
1984
1986
1986
1987
1988
Year
GT Index
GA Index
GNA Index

Figure 2

Table 1: Estimates of GDP components (in 1975 constant prices), Ghana,1975-87.

Year	GT	GT Index	GA	GA Index	GNA	GNA Index
1975	5283	100	2518	100	2765	100
1980	5538	105	2957	117	2581	93
1981	5344	101	2881	114	2463	89
1982	4974	94	2724	108	2250	81
1983	4747	90	2534	101	2213	80
1984	5158	98	2780	110	2378	86
1985	5420	103	2798	111	2622	95
1986	5702	108	2890	115	2812	102
1987	5976	113	2891	115	3085	112

Source: Vercueil,J., "Setting targets for agricultural planning: from macroeconomic projections to commodity balances - an illustration with the CAPPA system", Report prepared under the Project GHA/88/P04 ("Use of population variables for modifying agricultural production targets and policy decisions"), MANUSCRIPT, 15 April 1989.

Table 2 : Estimates of expenditures and resources, Ghana, 1983 (in million cedis).

Expenditures		
Government consumption	(G)	10,787
Private consumption	(C)	172,140
Gross capital formation	(Y)	6,901
Exports	(X)	11,238
	Subtotal	201,066
Resources		
Agricultural GDP	(GA)	109,927
Non-agric GDP	(GNA)	74,111
GDP (market price)		184,038
Imports	(M)	17,028
	Subtotal	201,066

Source: Same as Table 1.

245. One practical problem that arises with the use of trend data in a context such as this is the extent to which agricultural growth depends on the output in the other sectors. The inter industries matrix provides one way of viewing how much is sold and bought between the various producing sectors of the economy. The CAPPA system neither proposes devices to conduct the input/output analysis nor conducts the preparatory analysis of time series in order to assess past performances. It is therefore suggested that the agricultural planner should resort to his usual tools, data and methods to reach conclusions regarding the growth of GT, GA and GNA.

246. For example, using the relations in (6) and the data in Table 1, the projected GDP for Ghana(1988) would (in terms of index values) be

$$GT_{1988} = [(1.0585)^5]\ [90] = 120 \quad .....(9)$$

However, much as the data in Table 1 are useful as a guide for ascertaining the nature of the distribution's curve and probably, the annual growth rate of the GDP (components) series, they cannot be directly used for obtaining GDP (components) projections for the chosen horizon year principally because they are in constant prices (1975).

247. To obtain the GT value for 1988, it can be argued that if an index of 113 implied a GT_{1987} of 5976 (in 1975 constant prices), then the corresponding GT $_{1988}$ of 120 would imply 6346 million cedis. Additionally, it is observed that on average, the 1975 prices for the GT series were 38.809328 times lower than those in 1983; the corresponding estimates for the GA and GNA series being 41.365975 and 36.794277 respectively. Therefore the projected GT (1988) would approximate a value of about 246,284 million cedis (by substitution)70/.

248. This implies that over the 1983-88 period, the GT value grew by 246,284 less 184,038 (from Table 2) or 62,246 million cedis. For the agricultural sector, the index for GA (1988) can be derived from the relation

$$GA_{1988} = [1.0325]^5\ [101] = 119....(10)$$

If an index of 115 implies a GA value of 2,891 (see Table 1), then as for the GT, the GA (1988) would equal 123,767 million cedis. This also implies that the GA series grew by 123,767 less 109,927 or 13,840 million cedis during the 1983-88 period. The corresponding values for GNA (1988) would be 122,517 and 48,406 million cedis respectively.

249. It is to be stressed that the Ghanaian example may not necessarily apply to every other country. For instance, consider the data in Tables 3 and 4 for Nigeria and Lesotho. In the Nigerian case, a rough sketch of the time series (see Fig. 1) reveals a simple parabola curve depicting the resulting economic fluctuations following developments since the oil crisis in 1973 and the subsequent involvement of the country with SAPs since 1986. As in the case of

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70/ Vercueil, J. (1989), op. cit. pp.9-13.

Ghana, a geometric function can be fitted to the 1984-88 sector of the GDP curve.

250. Again for illustration, the last two columns of Table 3 show the estimated GT values for Nigeria using the exponential and geometric functions respectively. Although there are still differences, the geometric function appears to give a better fit than the exponential function. Using the later, the user can check to see that the GT for Nigeria was growing annually at a rate of 5.31 % during the 1984-88 period. The corresponding growth rates for the GA and GNA series are 7.99 and 3.78 per cent respectively. Information similar to those for Ghana used to obtain the actual projected values of all three GDP components are needed to obtain the actual GT,GA and GNA values for Nigeria in the horizon year (eg. 1989).

251. In the case of Lesotho, the last two columns of Table 4 also provide estimated GT values using the exponential and geometric functions respectively. As there is very little to choose between the two functions (given the index values), the geometric function is also used to obtain an annual growth rate of 6.40; 4.80 in the GA and 6.76 series respectively for the 1984-88 period. Again information similar to those used to obtain the actual projected values of all three GDP components for Ghana are needed to obtain the actual GT, GA and GNA values for Lesotho (1989), in the horizon year.

252. The illustrative data for Ghana, Nigeria and Lesotho are time series. As is well known, the mathematical and statistical determination and projection of the components of a time series do not necessarily produce accurate forecasts. This is because the analyses rest upon the assumption of stable political, economic and social conditions during the historical period covered by the data being studied. But evolutionary changes in the society should be taken into account. Abrupt and major changes will produce jumps or declines in a series which cannot be explained within the previous framework (eg see the 1975-80; 1980-83 and 1984-87 periods with respect to GT, GA, and GNA in the Ghanaian example).

253. Therefore although mathematical projections alone are largely valueless, they do provide a basis on which to build. Accordingly and as noted earlier, experience with judgement and intuition should be used to modify the anomalies which impersonal techniques produce. By combining an analysis of past events with the perspective of human judgement in evaluating sudden change, plausible forecasts can be made.

Table 3: Estimates of GDP in constant prices for Nigeria,1981-88 (at 1984 constant factor cost).

Year	GT	GT index	GA	GA index	GNA	Y(tE)	Y(tG)
1981	70,396	112	24,460	103	45,936	-	-
1982	70,157	111	25,082	105	45,075	-	-
1983	66,389	105	25,009	105	41,380	-	-
1984	63,006	100	23,799	100	39,207	110	100
1985	68,916	109	27,795	117	41,121	171	105
1986	71,076	113	30,356	128	40,720	266	111
1987	70,741	112	29,810	125	40,931	412	117
1988	77,752	123	32,273	136	45,479	640	123

Source: Federal Office of Statistics,Lagos (Nigeria), "GDP at 1984 constant factor cost,1981-88".

Table 4 : Estimates of GDP in constant prices (1980), Lesotho, 1980-88.

Year	GT	GT Index	GA	GA Index	GNA	Y(tE)	Y(tG)
1980	247.2	100	79.0	100	188.9	-	-
1981	247.2	100	73.6	106	185.2	-	-
1982	255.0	103	65.3	85	205.4	-	-
1983	232.8	94	49.8	83	184.4	-	-
1984	255.8	103	54.9	92	202.4	107	103
1985	265.6	107	53.7	88	214.5	110	110
1986	271.7	110	50.9	84	222.9	114	118
1987	291.4	118	53.1	88	240.0	117	126
1988	327.2	132	66.0	111	262.2	121	136

Source: Lesotho National Accounts,1980-88,Bureau of Statistics, P.O.Box 455,Maseru (September,1988).

254. This point is important because the ultimate growth rate of the GDP is a function of several variables including state policy (eg. fiscal and monetary policies), exogenous conditions (eg. drought, famine, rainfall, etc), and the lag structure. Accordingly, it is suggested that the user, rather than simply relying on one factor, should consider the interplay of these several factors while estimating the growth of the GDP components for the horizon year.

255. This task is not an easy one and underlines the suggestion that agricultural planning should involve a multi-disciplinary team of agronomists, econometrician, etc. Before proceeding to the projection of the required investment, the user has to validate the GDP estimates just obtained to serve as input to the next step. This ensures that the GDP calculations thus completed are saved and carried over by the system to subsequent computations.

INVESTMENT

256. The next step in the projection sequence is to assess the level of investment required to achieve the growth of the GDP that has just been assumed for the horizon year. Because investment should increase the productive capacity of a country the basic tool for this purpose is the incremental output ratio (ICOR). Basically, ICOR is the amount of global gross investment required to increase overall production by one unit (ie. the increase in the capital stock of the country).

257. Given a projected GT value, the total investment required over the period to generate the later can be calculated using the familiar Harrod-Domar71/ development equation:

$$dy / y = s / k \quad \ldots\ldots\ldots\ldots (11)$$

where

y = national income;

dy = a small change in y;

s = savings ratio; and,

k = ICOR (incremental output ratio).

whence the productivity of investment (ie. sy) equals the product kdy (by simply cross-multiplying). To the extent however, that a year by year ICOR is subject to random variations in the composition of investment and economic upheavals (drought, world prices, etc.), it is suggested that a series of ICOR values rather than a point estimate should be used.

71/ Todaro,M.T., Economic development for third world countries, op. cit.

258. It is reported that during the 1960s, the ICOR ranged from 1.5 (the most efficient) to 5 (considered then as highly unproductive). At the turn of the 1980s, national ICORs ranged from eight to twelve72/. A low ICOR implies that economic growth can be obtained with relatively small amounts of investment (eg. an ICOR of 2 implies that in two years time, the additional production will be enough to compensate for the cost of investment). With a high ICOR, the capital invested is not yielding much increase in the GDP (eg. an ICOR of 8 implies that during 8 years, the additional production should be absorbed by the repayment of the investment made). Thus a high ICOR is a signal that the capital invested is not yielding much increase in production (ie. GDP). However, because the ICOR is a synthetic indicator which may hide the diversity of prevailing conditions for the dynamics of production and the orientation of investment, it should be analyzed carefully in relation with the main orientations of the domestic policies.

259. In the Ghanaian example, available evidence indicates that the ICOR grew by 1.48 annually over the 1983-88 period73/. This implied that on average, in 1.48 years, the additional production of the Ghanaian economy during 1983-88 (246,284-184,038 or 62,446 million cedis) would be enough to compensate for the cost of the investment. Hence over the 5 year period (1983-88), the total investment required can be calculated as 1.48 x 62,446 or 92,124 million cedis (ie. k = 1.48 = ICOR; dy = 62,446 m cedis = the change in total GDP over the 1983-88 period).

260. This amount (92,124 m cedis) is to be progressively spent over the 1983-87 period. There is need to choose a time path for this investment. From Table 2, the estimated gross capital formation for 1983 is 6,901 m cedis. The cumulated investment over the 1984-87 period is 92,124 less 6,901 or 85,223 m cedis. Assuming an annual growth rate of 5.85 % (approximately 6% for ease of computations), for the GT, the required time path can be obtained from the relation

$$X + (1.06)X + (1.06)^2 X + (1.06)^3 X = 85,223 \ldots . \quad (12)$$

From the relation in (11),

$$X = 85,223 \div (1 + 1.06 + 1.125 + 1.193)$$

$$= 85,223 \div 4.378 \text{ or } 19,508 \text{ m cedis.}$$

Hence the required time path for the investment is :

1983	6,901
1984	19,508
1985	20,678 (from 1.06 x 19,508)
1986	21,919 (from 1.06 x 20,678)
1987	23,234 (from 1.06 x 21,919)
1988	24,628 (from 1.06 x 23,234)

72/ Vercueil, J., (1989) op. cit., pp.14-16.

73/ Ibid.

In other words, the value of I_{1988} is 24,928 m cedis.

261. In order to continue with the projection sequence, (following the completion of projecting the GDP components), the user should thence provide either the ratio of investment to GDP (%) or ICOR in order to compute the value of the investment that will be consistent with the GDP values just derived. From the above discussion, the ICOR for Ghana was estimated to grow by 1.48 annually over the 1983-88 period. By supplying this information (when prompted), the SYSTEM then computes the ratio of investment to the GDP74/. The user then validates this result so that it can be fed into the next step.

GOVERNMENT EXPENDITURE

262. A fiscal policy of a government may be to maintain, reduce or increase the share of GDP that is subjected to public expenditure. The user only has to substitute such assumption in (3) above by defining G (ie growth rate of government expenditure) either by directly indicating the growth rate of G and the average ratio to GDP (ie. ARG) where ARG = G/GDP; or indicating the marginal ratio to GDP (ie. MRG) where MRG = dG/dGDP75/.In the Ghana case, a growth rate of 5 % in the GDP was established for the projection period76/. Using this value, the government expenditure, G in 1988 can be derived from the relation :

$$G_{1988} = [1.05]^5 \,][G_{1983}]$$

$$= 1.2762816 \times 10{,}787 \text{ (from Table 2)}$$

$$= 13{,}767 \text{ m cedis77/} \quad \ldots\ldots\ldots \quad (13)$$

74/ To guide the user, this computed value will be seen to be 10.31

75/ In this regard, the user should note that if the marginal is lower than the average ratio to GDP, then the share of public expenditure in GDP will be declining over time; it would remain constant if marginal and average shares are equal; and, increase if the marginal is higher than the average ratio. In a budget deficit situation, usually an objective fiscal policy is to reduce such deficit so as to check inflation, restore the balance of payments and enhance the development of efficient production activities. Deficit reduction may be achieved through reduced public expenditure or improved revenue collection. Equally, if reduced expenditure is resorted to, there would be need for care so as not to disrupt essential services needed to maintain production capacity in sectors such as agriculture. The options open to the user depend on the data available.

76/ Vercueil,J., (1989), op. cit. pp.17-18.

77/ From first principles, ARG (1988) = 13,767/246,284 = 5.59 %. The user can compare the latter with ARG (1983) value of 10,787/184,038 or 5.86 %. The corresponding MRG then becomes (13,767 - 10,787) / (246,284 - 184,038) or 4.79 %. Thus an increase of 100 in the GDP (over the 1983-88 period), would have to be allocated to increasing government consumption expenditure (during the same time interval).

263. The system requests the user to provide, at this point, any one of three options including growth rate (%) of government consumption expenditure, average ratio to GDP (ARG) and marginal ratio to GDP (MRG). By supplying a growth rate of 6% on being prompted, the SYSTEM automatically calculates the corresponding ARG and MRG values (as 5.54 and 4.63 respectively). The user then validates these results and proceeds to the next step in the projection sequence.

EXPORTS

264. To project exports for the horizon year (1988), the user should examine past performances of exports in relation to overall economic growth. The appropriate indicator to use is the elasticity of exports to GDP (ie. EX) :

where

$$EX = [(X_1 - X_0) \div X_0] \div [(Y_1 - Y_0)] \div Y_0] \quad \ldots\ldots\ldots\ldots (14)$$

The user should note as well that exports elasticity is synonymous with the ratio of the growth rate of exports to that of GDP. An examination of the prevailing empirical evidence would be useful in this regard. In the Ghana example, an export elasticity of 2.5 was assumed78/. Thus the growth rate of exports becomes :

$$GX = EX \times GY = 2.5 \times 5.85\ \% \text{ or } 14.6\ \% \quad \ldots\ldots (15)$$

This estimate of the growth rate in export earnings of 14.6 is basically synonymous with 15 % (adopted subsequently for ease of computations).

Hence $X_{1988} = [(1.15)^5][X_{1983}]$

$= 2.0113572 \times 11{,}238$ (from Table 2)

$= 22{,}604$ m cedis

ESTIMATING IMPORTS (M) AND PRIVATE CONSUMPTION (C)

265. Thus far, four of the six unknown parameters in (4) above have been projected for the horizon year (1988) namely the GDP (Y), investment (I), government expenditure (G) and exports (X). From the relation in (4),

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78/ Vercueil, J., (1989), op.cit. pp. 18-19.

$$C - M = Y - I - G - X \quad \text{.....(16)}$$

$$= 246284 - 24,628 - 13767 - 22604$$

$$= 185,285 \text{ m cedis.}$$

Again from first principles,

$$S = Y - C - G \quad ; \text{ and, } \quad F = X - M$$

where S = Savings and F = Trade gap.

Based on the data for Ghana[79], the trade gap was fixed at 0.11 % of the GDP. Thus

$$F_{1988} = (0.11 \times 246,284) / 100 = 271.$$

Hence

$$M_{1988} = X_{1988} - F_{1988} \text{ or } 22,604 - 271 = 22,333.$$

By substitution, $C_{1988} = 207,618$ m cedis.

266. In summary, the outcome from the CAPMAC module yields the following GDP components for Ghana in the base and horizon years:

GDP Component	Base year (1983)	Horizon year (1988)
GT	184,038 m cedis	246,284 m cedis
GA	109,927 "	123,767 "
GNA	74,111 "	122,517 "
Investment	6,901 "	24,928 "
Exports	11,238 "	22,604 "
Imports	17,028 "	22,333 "
PCE	172,140 "	207,618 "
GCE	10,787 "	13,767 "

By validating these results, the system automatically carries them forward as, inputs into the next modules in the sequential scenario building process. The only purpose served by the macro-economic table in this process is the projection of demand based on per capita consumption expenditure (PCE).

267. However, together CAPPOP and CAPMAC constitute the overall quantitative framework within which the scenario is cast. Because CAPPA does not ensure consistency of the growth rates resulting from the constructed scenario with the

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79/ Vercueil, J., (1989), op. cit., pp. 20-21.

initial macro-economic table, the later may be revised if serious discrepancy emerges at the end of the scenario construction.

[Food and non-food demand projections: CAPDEM]

268. The projected population and PCE are now used to project food and non-food demand for agricultural crops in the horizon year on the basis of a set of independent commodity specific demand equations and commodity crop conversion factors. Prices are assumed to be constant.

269. The objective of the CAPDEM module is to prepare the projections of demand for food and non-food products. Both of these are used to study the balance of demand, foreign trade and domestic production for each commodity in order to set the production targets for the entire scenario. The rationale behind the module is to base the development of agricultural production on the future domestic demand for agricultural goods.

270. The module uses (i) the FAO demand projection system (ie. per capita demand as a function of per capita private consumption expenditure); and, (ii) as data, the consumption of each food or industrial good in the selected base year80/.

(i) Projecting food demand

271. To guide the planner in using the CAPDEM module in projecting the demand for food, it is pertinent to first outline some of the factors affecting such demand81/. The first factor is the growth rate and composition of the population; a change in both of these will certainly affect demand for food. The second factor relates to the change in population distribution (eg. urban and rural composition); again the consumption of different kinds of food differs between rural and urban areas. Accordingly, it is important to use different projections of population growth, age-sex structure and rural urban distribution in projecting food demand.

272. A third factor is the change in per capita income between the base and horizon years (ie. the plan period). Such change relates to (i) per cent change in incomes; and (ii) income elasticity (ie. the % change in consumption resulting

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80/ The specified data set for the module include: (i) Food demand (for each crop) - function type ; - elasticity of demand with respect to income in the base year; - trend factor or - total demand at the horizon year or per caput demand at the horizon year - maximum consumption income ; (ii) Industrial demand (for each crop to be modified) - function type - elasticity of demand with respect to GDP - trend factor or - total demand at the horizon year.

81/ United Nations (FAO), Introduction to agricultural planning:Agricultural Planning Studies,No.12 (FAO: Rome, 1970).

from each % change in income) ; the product of both of these gives the per cent increase expected in food consumption. Although the change in per capita expenditure (over the plan period) is same for all commodities, the impact of this change on demand levels is specific to each commodity. Thus the problem in projecting food demand is that income elasticity differs for each food item.

273. To overcome this problem, FAO had developed for use (in this regard) four income elasticity functions consistent with the nature of the food item. Both the function type and the associated elasticity values are read from the Reference Scenario (or data base) and can be modified and made scenario specific if necessary82/.

274. A fourth factor affecting food demand is the price elasticity (ie. % change in sales for a product resulting from a % change in its price). Lack of time series data usually does not permit the computation of price elasticity; the latter can be estimated from income elasticity assuming that the value of both elasticities approximate each other if the commodity has no close substitute (eg sugar); but if it has, then its price elasticity can be presumed to exceed that of the entire commodity group (eg. rice vs cereals; poultry vs all meat, etc.).

275. Overall, the four factors considered thus far in food demand projections are relevant in a country with a satisfactory level of nutrition. If malnutrition is widespread, the pattern of food demand based on specific nutritional targets should be derived by multiplying the per capita calorie and protein intake targets for the various strata of population (age and income groups) by the number of people per stratum and thence transformed into food equivalents using

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82/ The four functions are :

1. The "Log-Log" function (ie. Log $y = a + b \log x$), where y = per capita consumption and x = per capita income. This function implies a constant income elasticity of demand throughout the projection period; and, can be used in projecting food items that would remain below saturation level through the projection period;

2. The " Semi-Log" function (ie. $y = a + b \log x$) implies a proportional decline in the absolute value of income elasticity coefficient (b/y) relative to changes in food quantities consumed (ie. the income elasticity of demand is inversely proportional to the demand level);

3. The " Log- Inverse" function (ie. $\log y = a - b/x$) implies a decline in the value of the elasticity coefficient (b/x) proportional to the increase in per capita income (ie. the income elasticity is inversely proportional to the level of income : per capita demand progressively approaches the saturation level); and,

4. The " Log-log inverse" function (ie. $\log y = a - b/x - c \log x$) provides for an increase in per capita consumption up to a maximum intake followed by a decline as income increases; the coefficient of elasticity being $(b - cx) \div x$ (ie demand increases up to a maximum and then declines as income reaches higher and higher levels).

appropriate conversion factors. A trend factor may then be introduced to shift the projection upwards or downwards.

276. Since data constraints inhibit the computation of these various food demand elasticity functions, FAO had provided estimates of demand elasticities and functions for several commodities. These are built into the CAPPA system and are automatically assessed at an appropriate point in time in the scenario building process. Otherwise useful estimates of demand functions and elasticities can be derived from a country with similar conditions.

277. For the Ghanaian example, the data required for the CAPDEM module (and stored in the data base) comprise 52 food and 13 non-food products.83/ This is for the base year (1983); the next step in this stocktaking exercise is then the demand projections for the horizon year (1988).84/

278. First food demand is projected on a per capita basis ; this is multiplied by the total population derived from CAPPOP to obtain the total domestic demand for the particular food commodity. This is then related to per capita income by a commodity specific demand function as outlined earlier. Operationally, the projection of demand is a function of income; the shape of which depends on the function type selected.

279. In general, the total demand for a given food commodity in the horizon year (DTH) equals the product of horizon year per capita demand for the commodity (DPCH) and the horizon year total population (POPH). In symbols

$$DTH = [DPCH85/][POPH] \quad \ldots\ldots\ldots (17)$$

83/ The food products for the base year (1983) include cassava (estimated at 143.1 kilograms per annum); plantain (57.9 kg/year); yams (51.6 kg/year); roots (47.0 kg/year); vegetables (40.5 kg/year); maize (29 kg/year); millet (12.1 kg/year); beer (12.0 kg/year); rice (10.0 kg/year); wheat (8.3 kg/year); meat (7.1 kg/year); oil crops (6.7 kg/year); vegetable oils (4.9 kg/year); finnish process (4.5 kg/year); skimmed milk (3.8 kg/year); other fruits (3.3 kg/year); other alcoholic beverage (2.6 kg/year); lemons-limes (2.0 kg/year); raw sugar cent (2.0 kg/year) and spices (1.6 kg/year). The next 20 products have kg/year values of less than 1.6 while the last 12 have kg/year values of zero.

84/ In terms of guidelines (i) the base year should be representative so as to minimize the effect of influential factors; (ii) a distinction should be made between food and non-food products and between urban and rural areas; and, (iii) cognizance should be taken of the change in per capita income.These call for different projections of population growth, age-structure and rural-urban distribution; the planner should use the projection that is most likely to materialize (eg. the normative scenario).

85/ The value of DPCH can be obtained using any of the following five function types:
(i) Function Type 1: $\text{Log } y = a + b \log x$

280. From DISPLAY TWO, the CAPDEM module is assessed by entering the key D. Automatically, the Reference demand projections are updated using the currently prevailing population and macro-economic projections as well as parameters of the Reference demand projection (ie. the function type per commodity, income/price elasticity per commodity; trend factor, maximum consumption income,total demand, per capita demand, etc.).

281. The menu of CAPDEM comprises (i) food demand (F); (ii) industrial demand; and, (iii) display nutritional results. Concerning the food (F) and industrial (I) demand projections, if the user opts for the modification, the system prompts him/her to provide an alternative value for the function type, elasticity, trend factor, maximum consumption income, total demand and per capita demand. For each such new entry, the system recalculates values for all the other (five) parameters.

282. For example, in the Ghana data base, the function type and elasticity for cassava are 2 and 0.2 respectively; the corresponding values for plantain are 3 and 0.1 respectively. In other words, whereas for cassava a 20 % increase or increase in the income of its consumers would result in a 20 % increase or decrease in the quantity of cassava demanded (or consumed); the corresponding

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where a = log DPCB (ie. commodity base year per capita demand) minus DELB (ie. base year income elasticity demand) multiplied by log PCEB (ie. base year per capita expenditure); and, b = DELB (ie. base year income elasticity of demand) whence the per capita demand for each commodity in the horizon year or DPCH (in symbols)

$$DPCH = DPCB[\ PCEH \div PCEB\ ]^{DELB} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

(ii) Function Type 2: $y = a + b \log x$

where a = DPCB multiplied by [1 - DELB log PCEB]; and, b = DPCB multiplied by DELB whence

$$DPCH = DPCB\ [\ 1 + DELB\ (\ \log(PCEH \div PCEB))] \ldots\ldots\ldots \quad (2)$$

(iii) Function Type 3: $\text{Log } y = a - (b \div x)$

where a = log DPCB + DELB; and, b = DELB multiplied by PCEB whence

$$DPCH = e^{[a-(b \div PCEH)]} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(18)$$

(iv) Function Type 4: $\text{Log } y = a - b \log [x - (c \div x)]$

where a = log DPCB + b log PCEB + (c ÷ PCEB); b = c ÷ PCDM (ie. the level of PCE to which the maximum level of demand is associated); and, c = DELB multiplied by PCDM ÷ (PCDM - PCEB) whence

$$DPCH = e^{\{a\ -\ b\ \log\ PCEH - (c \div PCEH)\}} \quad \ldots\ldots\ldots\ldots\ldots \quad (19)$$

(v) Function type 5: DPCH = DPCB (the constant function).

values for plantain are respectively 10 percent. This implies that in the data base (ie around 1983), it was assumed that cassava was a more responsive food item (than plantain) to increases or decreases in income. In other words, all things being equal, with development, more cassava would be consumed by the Ghanaian population than plantain. Equally, whereas the "semi-log" function was assumed (in the data base) for cassava, the " log inverse" function was assumed for plantain.

283. In case the user does not have any new information, the data base Reference values are used by the system to derive projected demand for these and other commodities in the horizon year (1988)86/. The outcome is a table with the total and per capita projection per commodity together with the corresponding rural-urban breakdown using the input from CAPPOP. The user will observe that all the 52 food items in the Ghana data base had zero values for the trend factor and maximum consumption income.

284. Since food demand differs between rural and urban areas, if the user wishes to modify the rural urban PCE for the horizon year, he/she can provide an alternate value for rural and urban per capita PCE; any of these that is provided fixes the value of the other.

(ii) **Projecting industrial goods demand**

285. Non-food demand projections correspond to the requirements of the local industries for agriculture raw materials (eg. fibres, rubber, tobacco, wool, hides, skins, etc). Unlike food, the demand for industrial goods is the sum of the demands for its end users. The main difference is that population is not identified separately as a growth factor and global (not per capita) demand figures are projected. Hence in projecting industrial goods, the methodology for food products has to be modified by (i) defining the various end users of the commodity; (ii) calculating the demand for each end product; (iii) determining the input coefficients for each end product; (iv) multiplying the coefficients in (iii) by the domestic output of each end product; and, (iv) allowing for possible substitutes (eg. synthetic goods). These are built into the data base.

286. As for food demand projections, if the planner opts to modify the input parameters per industrial good, he/she has to provide the function type, elasticity of demand per industrial good, trend factor or total demand. In this

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86/ In this regard, the projected demands (1988) were in terms of kg/year 144.7 for Cassava; 58.2 for plantain; 51.0 for yams; 46.2 for roots; 41.2 for vegetables; 29.8 for maize; 12.3 for millet; 12.6 for beer; 10.4 for rice; 8.7 for wheat; 7.4 for meat; 6.7 for oil crops; 5.0 for vegetable oils; 4.6 for finnish process; 4.0 for skimmed milk; 3.5 for other fruits; 2.8 for other alcoholic beverages; 2.1 for lemons-limes; 2.1 for raw sugar cent; and 1.6 for spices.

regard, the planner notes that demand per commodity can be related to GDP growth or otherwise can be projected using a trend factor87/.

287. Only one functional form is considered in the Technical Manual to relate the growth of industrial demand to the growth of the GDP. In symbols,

$$DTH = DTB\ [1 + DEL\ \{(GDPH \div GDPB) - 1\}] \ldots\ldots\ (18)$$

[Supply utilization Accounts :CAPSUA]

288. The projection of domestic demand for food and non-food gives important indications as to the orientation of the agricultural food pattern. But before using these indications for setting production targets, the role of foreign trade should be taken into account. This is the task of CAPSUA.

289. The production targets are derived by setting the trade objectives based on the supply utilization account (SUA) identity which stipulates that the production of a crop equals the sum of six entities namely (i) food demand; (ii) non-food demand; (iii) animal feed88/ demand; (iv) seed89/; (v) waste90/; and, (vi) net foreign trade (ie. imports minus exports). In other words, with the projections of food and industrial demand as the first and second steps of phase one in ASA, a third step is the projection of production (ie. supply).

290. Having derived the domestic demand for each food and industrial commodity, the CAPSUA module is used to prepare the SUA for each commodity at the scenario horizon. A SUA is a table that balances all sources of

(i) **supply = production + imports + stock (from)**; and,
(ii) **utilizations (demand) = consumption (food, non-food,seed and feed) + exports + waste + stock (to).**

87/ When a trend factor is used, the demand function (for the given industrial good) is shifted up or downwards but the income elasticity is always kept unchanged. There is also the possibility of overwriting the projection result with an independently defined total or per capita demand level in the horizon year. In this case, an implicit trend factor is computed to keep track of the introduced change. The consistency of rural, urban and national projections is ensured by means of the trend factor (as a default adjustment, subject to modification on behalf of the planner.

88/ Feed is the quantity of the commodity's supply used in animal production.

89/ Seed is the quantity of the considered commodity used as an input into crop production.

90/ Waste encompasses all possible sources of losses during production, transportation, storage and consumption.

By itself Production = domestic utilization + net trade.

But this production identity may not always be realized (due to data inconsistencies) and hence the need to ascertain the statistical discrepancy (SD) where

SD = Production - Domestic utilization - Net trade91/.

291. In cases where supply exceeds demand, the adjustment can be achieved through (i) increasing size of the cropped land; (ii) raising the yield rate of land; (iii) using pricing (and other) policies to reduce demand; (iv) importing the deficit; and, (v) adjusting stocks. But,if demand exceeds supply, then the adjustment can be effected through (i) reducing the cropped area; (ii) reducing the use of inputs; (iii) using (pricing or other) policies to increase demand; (iv) raising exports; (v) adjusting stocks; and, (vi) combining alternatives (i) through (v).

292. In CAPPA the concept of self sufficiency is used to measure the proportion in which the domestic utilizations is met by domestic production. The self sufficiency ratio[(SSR) equals (i) Production ÷ [Production - Net trade] or (ii) Production ÷ Utilizations or (iii) [{(Utilizations + Net trade) ÷ Utilizations}]. The Technical Manual92/ recommends that the estimate of SSR in (ii) should be avoided while asserting that the absence of trade (implicit in (ii)) is a good sign that there exist self sufficiency.

293. To reiterate, from the Technical Manual the SSR assumption implies an overall balance such that the sum of total production (SPR) and imports (SIM) equals the sum of food consumption (SFO), industrial consumption (SIN), feed (SFE), seed (SED), waste (SWA), exports (SEX), and a statistical discrepancy (SSD). In symbols,

SPR + SIM93/ **= SFO+SIN+SFE+SED+SWA+SEX+SSD**..... (19)

91/ Consider for example the cassava commodity in the Ghanaian CAPPA data base where estimates of food, non-food, seed, waste and feed are 1824, 633.3, zero, 86.7 and 51.7 respectively. Thus total utilizations equal 2596. Imports, exports and net foreign trade each equals zero. Hence production equals 2596 and statistical discrepancy equals zero. The same SD values are reported for maize, cotton, yams and citrus. But for cocoa, paddy and coffee, the SD values are -21, -16 and -0.1 respectively (see Vercueil,J., (1989) op.cit., p. 51.

92/ Vercueil,J. (1985), op.cit.

93/ In this relation (from the Technical Manual by Vercueil,J. (1985), op.cit.)

SED = S [SPR] ..... (1)
STD = SFO + SIN + SFE + SED + SWA ..... (2)
SWA = w [SFO + SIN + SFE + SED + SEX]..... (3)
SNT = SEX - SIM ..... (4)
SEX = MAX [0,SNT]; SIM = MAX[0-SNT]..... (5)
r = SPR ÷ [SPR-SNT]..... (6)

294. The Technical Manual also stipulates that the value of the SSR be kept constant over the horizon period. If the constant SSR assumption is unacceptable to the planner, he/she can modify the default SUA by providing any value for seed, waste, feed, imports, exports, production and self sufficiency. Any such changed value leads automatically to the balance (in equation 19) being readjusted94/.

295. The outcome of the CAPSUA module is thus a set of commodity production targets. At this initial stage of the scenario building process, such targets are based on crude estimates of the sector's intermediate consumption in feed requirements. A subsequent study of the production pattern may lead to a revision of these initial projections. The provisional production targets set in this module are necessary to initiate the analysis of production within a coherent framework. They constitute the subject of this second phase of the scenario building process.

296. Overall, the SUA is a useful tool for presenting a complete picture of the relative importance of various sources of supply and utilization of a commodity. By examining a time series of SUA, the planner can deduce the changes in the relative weights of the commodity balance constituents over time. By aggregating such changes, he/she can obtain insights on the structure of production and utilization for some or all commodities through a comparison of the measurement in value terms versus in calories95/. The calorie/price indicator of the aggregate SUA highlights the calorie content of each item per

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where
STD = total domestic utilization; SNT = net trade;
s = seed ratio ; w = waste ratio;
r = self sufficiency ratio.

94/ For instance, in the document "Setting targets for agricultural planning", by Vercueil,J. (1989), op.cit., a very lucid expose of the mechanics of changing the various components in (19) above is given (see pages 55-75). In this regard, the projection of the SUA raises two issues namely fixing appropriate levels for the individual items and keeping the account in balance. This projection is the 'default projection' built automatically by the system once the food and non-food projections have been effected.

95/ For example, the analysis contained in Vercueil,J. (1989),op.cit. reveals that for Ghana (1983), non-food utilizations were more important in terms of calories than in value terms mainly because they related to staple products. The high calories content of imports collaborates the food dependency that is not apparent from the aggregate SSR measured in value terms; on the contrary, the calories SSR point to a food deficit situation.

unit of the national currency (being used) with reference to the average for all utilizations.

297. The main new dimension in the projection of SUA for agricultural commodities is the balance between domestic production and foreign trade. In this regard, the Technical Manual (1985 version) has outlined several relevant underlying criteria to be taken into account. These include the development of domestic demand (food, non-food,seed,feed and waste); the prospects for international export markets; the production potentials of the country; indicators of comparative economic efficiency; and, the overall trade balance target. Four other complementary aspects of these criteria are also stressed namely the income of producers, the budget impact, the distributional impact and the modernization aspect96/.

298. In the final analysis, the food balance sheet (FBS) that can be extracted from a comprehensive set of SUAs and summaries of all the sources as well as competing utilizations of food commodities in a country are useful for identifying the main directions of improvement of the food diet97/.

299. The main constraints here are lack of data as well as reliable and operational response coefficients. Efforts should be made first to identify the factors affecting future production such as (i) increase in the supply of material inputs and their direct effect on output; (ii) technical measures for raising the productivity of inputs; and, (iii) provision of economic incentives and institutional reforms affecting production. Both (i) and (ii) directly increase agricultural production but (iii) does so indirectly. However, the weaknesses of production estimates and trade statistics are well known. Food consumption is often not known directly. Usually seeds data are basically guessestimates. The amount of feed can only be estimated through farm surveys. Waste can only be known through crude estimates.

300. The use of the SUA framework can only improve the reliability of the data that it brings together thereby pointing to fields of uncertainties where an improvement in the data collection system is the only clue to better planning.

Phase Two: Deriving the production schemes

301. Given the production targets thus set in phase one, the second phase involves the derivation of a production scheme to meet these targets. The first step in this regard is to work out a land development scheme or a resource table (ie. to decide on the increase in land resource by type). For each land type, arable and cropping intensity are decided. This is followed by decisions

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96/ For details see Vercueil,J., (1989),op.cit., pp. 68-72.

97/ The FBS is usually completed with a calculation of the calories content and other nutrient intakes that accrue to the population on average. Such indicators are measured per person per day in order to compare with human consumption.

regarding area yield for each crop by land type. If it is not feasible to meet the production targets within the constraints of land resources and technological boundaries, the foreign trade account should then be revised to conform to the accounting identity in the SUA.

302. In effect, a critical task of an agricultural planner should be to assess the addition to cropped land within the plan period. Regarding labour, he/she should adopt measures to increase its efficiency such as changing the pattern of cropping to suit labour availability and altering the factor proportion between it and other inputs.

[Area and yield projections for all crops:CAPVGT]

303. These are the tasks of the CAPVGT module98/. It is used to prepare a consistent set of area and yield projections for all crops in all the six different land classes defined by FAO (ie. good rainfed, poor rainfed, naturally flooded, partially irrigated, fully irrigated and special areas) in the horizon year. The amount of land under each land class in the horizon period is a policy variable expressing the targets of land and water development in the country.

304. The planner should ensure that the cumulated area allocated to all crops in a given land class (as thus projected) do not exceed the total land resources per class; the total output per crop should be kept consistent with the other items in the SUA.

305. In particular, the task of meeting production targets for several crops simultaneous with abiding by the land constraints in several land classes presupposes a progressive adjustment process that the user should monitor with computation and information aids that are supplied by the CAPPA system. The user may find it useful to define groups of crops in order to work on smaller numbers of crops at a time. In this regard, the CAPVGT module performs automatic adjustments through iteration but the user should check these carefully.

306. Operationally, there are two phases in CAPVGT namely (i) fixing the land resources table (LRT); and, (ii) building the crop production scheme (CPS). With respect to (i), the base year data (or reference scenario) already contains the LRT. The Technical Manual stipulates that this can be modified by introducing new values for total arable area and average cropping intensity in any land class.

98/ For the CAPVGT module, the specified data requirement comprise the area harvested and crop intensity at the horizon year by land class. An additional but optional data requirement are (i) the list and composition of crop groups, harvested area at the horizon year for each group in each land class; (ii) harvested area and yield at the horizon year; and, (iii) for every crop that aggregates the agricultural products, allocation of the production of this crop according to the agricultural products concerned.

307. In the case of (ii), the Technical Manual also indicates that the reference area and yield tables can be modified either automatically by the system or through "user-driven modifications". However, the automatic adjustment should only be used when the gap between present and targeted output levels is marginal. In the case of modification by the user, the Technical Manual indicates that "for a given crop, the area and yield per land class can be modified until the combination of area, yield and output levels appear plausible; it is up to the planner to decide which future yield levels can reasonably be attained once a crop has been analyzed, other crop areas must adjust to compensate for that change".

308. This "compensation may be achieved by the planner directly by working out the production scheme for one or several crops belonging to the same group in such a way that the cumulated areas of all crops in the group tally to the available land for that group in each land class or through proportionate adjustment of all individual crop areas per land class". But automatic compensation invariably alters output levels and the planner's intervention is required if the previous output levels are to be restored through yield adjustment. The module offers 'HELP DEVICES' to assess the magnitude of the changes to be introduced.

309. However, given the tedium in designing a land and yield pattern for several crops among several regions of the country simultaneously with keeping consistency between the production targets and the land constraints, it is important that the planner should check to ensure that the projected yield levels remain feasible. For instance there is need to ensure that the total land allocated does not overrun the available land resource and that the projected outputs meet the production targets derived from CAPSUA.

310. From the Technical Manual, the menu of the module provides the planner with three choices: to define horizon year land resources (H); to define groups of crops (G); and, to modify crop areas and yields (M). Under (H), the planner simply defines the horizon year land resources99/; under (G), he/she either defines groups (D) or modifies group areas (G)100/; and, with (M), he/she

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99/ For instance, the base year (1983) Ghana data provided a total arable land of 4,511.0 kha with a cropping intensity of 0.747 and a harvested area of 3,370.0 kha. The corresponding horizon year projections were 4.676.0 kha, 0.744 and 3,370.0 kha implying growth rates (%) of 0.72, -0.08, and 0.64 respectively. The planner can check out these values while interacting within CAPVGT. The breakdown of the base/horizon year land resources by land type is also readily available.

100/ For instance, the planner will find that all the 34 crops defined in the Ghana data base are all in group A with a total area of 3,480 kha (none of this allocated to good rainfed land class; 120.5 (ie 3.5 %) to poor rainfed land class; 1186.8 (ie. 34 %) to naturally flooded land class; 2085.7 (ie. 60 %) to partially irrigated land class; 77.3 (2 %) to fully irrigated land class; and, 9.8 (ie about 0.5 %) to special areas.

either (i) displays areas and yields (D) 101/; or (ii) performs automatic adjustment (T); or (iii) performs adjustment per crop (C); or (iv) displays (target/projected) output (P). The Technical Manual provides illustrations of these various options.

311. To illustrate, the user of CAPPA can analyze different cropping patterns (for each of several types of agricultural land) in terms of their implications for imports and required amounts of agric inputs with an eye on comparative advantage. Such a planner has to determine the kinds of changes in policies required to induce a given cropping pattern on the part of farmers. Suppose the resulting projections of imports of agricultural goods are higher than expected under all scenarios, the CAPPA user may wish to hold discussions with experts in agric research and extension to determine realistic goals for higher rates of yield growth. Then an alternative yield trend may be entered for another experiment.

312. Such experts might judge the feasibility of the higher targets for yield growth and their implications for budgeting. With CAPPA those targets would be linked to other economic variables and perhaps to underscore the importance of more effective programmes. For instance, investment in irrigation or improvement in rainfed land could be the key programme and CAPPA could be used to ascertain how to link up with other variables.

[Livestock development projections: CAPANM]

313. The CAPANM module is used to prepare projections of livestock activities and the corresponding feed balance at the horizon year of the scenario. Livestock development is projected in terms of stock numbers, extraction or milking rates and yields for different livestock activities (ie. livestock systems as described within the system); the resulting output should meet the animal production targets defined in CAPSUA. According to the Technical Manual, since animal production targets and feed allocations are part of the commodity-wise S/U A analysis, CAPANM ensures that the projected livestock systems do produce the

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101/ For instance, the planner will notice that the total area (in kha units) of the 23 crops (out of the total 34) for the base year (1983) for Ghana is 3,370 (with 52.6 of this for rice, 419.5 for maize, 172.3 for millet, 222 for sorghum, 112 for plantains, 302 for cassava, 147.5 for yams, 155.3 for other, 3.0 for sugar cane, 42 for pulses, 119 for vegetables, 2.6 for banana, 17.1 for citrus, 19.8 for fruits, 230.4 for oil crops, 94 for palm oil, 113.1 for groundnuts, 28 for coconut, 1.083.3 for cocoa, 9.7 for coffee, 3.4 for tobacco, 8.3 for cotton, and 13 for rubber. On the other hand, the corresponding yields for the 34 crops (in unit tons per hectare) for the base year are .90, .87, .40, .39, 6.95, 8.60, 4.69, 4.28, 34.44, 0.29, 4.81, 4.28, 3.80, 2.35, 0.21, 0.32, 0.80, 5.0, 0.17, 0.17, 0.52, 0.78 and 0.54.

required outputs and that their feed requirements are consistent with available resources (domestic or imported)102/.

314. The unit feed requirements are associated with each system and the total feed demand should be checked against total feed supply. The feed supply originates from feed allocations defined in CAPSUA (S/U accounts) as well as from crop by-products103/. These feed allocations (or production targets) should be modified by the planner so as to obtain a balanced feed situation; changes are automatically fed back to the S/U accounts for the corresponding commodities and carried over into foreign trade projections. The labour requirements are projected on the basis of an average unit labour requirement in each livestock system and are taken into account in CAPLAB for the analysis of the agricultural labour supply/demand balance.

315. There is only one menu in CAPANM. The planner displays/modifies livestock production (L) or displays/modifies feed resources (R). If he/she opts for (L) or (R), the planner chooses one livestock system among the displayed and proceeds interactively with the desired modification. The user should validate these results on exiting the module.

[Projection of input requirements from crop production:CAPFAC]

316. In the course of crop and animal production analysis thus far, a number of changes might have been introduced in the estimated levels of production and feed requirements. The impact of the latter on foreign trade (left implicit so far) have to be explicitly worked out at this point; the implied adjustments on seeds and waste necessarily imply a revision of the S/U accounts for the affected commodities.

317. The module CAPFAC computes the factor input requirements (seeds, fertilizers, pesticides, and power (human,animal and mechanical)) that result

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102/ FAO has developed a more detailed computer package, the LIVESTOCK DEVELOPMENT PLANNING SYSTEM (LDPS) that specializes in the study of livestock-related issues. In this regard LDPS is even more flexible than the CAPANM. It is suggested that LDPS (in summary form) can be introduced as inputs to CAPANM; conversely, CAPANM hypotheses can be scrutinized (in terms of their dynamic implications) with LDPS.

103/ CAPANM uses initially the animal production targets and feed resources defined in CAPSUA. The characteristics of the livestock systems for the base year are given in the data base. The planner has to define those for the horizon (ie. number of systems units otherwise known as standard animals; the ratio of productive animals; the unit yield; and, the unit feed requirements). The energy content of feed products and by-products is part of the data base.

from CAPVGT104/. For each land class, the module computes the area unit consumption per factor in relation to the projected yield level through a specific production function that defines changing inputs requirements for a range of yield values; the area under the said crop in the said land class then determines the total consumption for this input. All this is done automatically (through an iterative process) by the system and the planner has no input; he/she simply analyzes the outcome. However, for the power required for these operations (human, animal and tractors), the planner can modify as desired. These are the only-user provided data within CAPFAC.

318. These inputs include seeds, fertilizers, pesticides and power (human, animal and mechanical). In relation with the projected yield level, the area unit consumption of each factor is calculated for each crop in each land class using a specific production function that defines changing inputs requirements for a range of yield values. The area under the said crop in the said land class then determines the total consumption for this input.

319. Given the later, the user then projects the share of human, animal and mechanical power in order to derive employment (man-days), animal traction (days) and tractor use (numbers and hours) at the scenario horizon. The demand and supply production projections thus described are only indicative. Together with the stocktaking exercise, they should form the basis of the plan targets.

320. In principle, the planner should merely provide a series of alternatives to be used by the politicians in selecting appropriate targets as well as policies and measures for implementing the latter. Given year to year fluctuation in production, it is to be stressed that all targets need not be precisely attained but the trend over a period of years should conform to the targets set consistent with desirable changes in the economy. The targets should therefore be consistent both among themselves and with the overall economic plan.

321. In setting these targets, emphasis should be given to meeting immediate shortages simultaneous with raising future productive capacity. Equally, the stock of development resources should be taken into consideration. In this regard, scarce resources should be economized and abundant resources utilized to the optimum. In particular, stock should be taken of any (i) production

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104/ For the CAPFAC module, the specified data input requirement comprise: - for each energy source, its conversion coefficient is man-days and its annual utilization at the horizon year; - by crop and eventually by land class: the share of energy necessary at the horizon year in the form of human, animal, mechanical work. In effect, the main data used in the CAPFAC module are (i) the crop production scheme (areas and yields tables per crop and land class in the horizon year); a set of data from CAPVGT; and, the technological matrix stored in the data base. The latter defines for each crop and in each land class, the quantity of each production factor required to cultivate one hectare of the crop under a technical level characterized by the crop yield obtained. These data are used to determine the total quantity of each input that is implied in the crop production scheme of the scenario.

potentialities already created but currently under utilized (eg. irrigation); and, (ii) gaps in available information on the functioning of the economy in the main farming regions. On these bases, short-term research and fact finding surveys should be initiated to obtain data needed for evaluating development and development measures. In other words, a review of the national development strategy should be undertaken and decisions taken on a matching strategy (using the targets) for agricultural development.

322. The main menu of CAPFAC has three options namely (i) to display/modify power conversion/utilization hypotheses (U); (ii) to display/modify power sources structure (S); and, (iii) to display results (R).

Phase Three: Analyzing investment and employment implications

323. "CAPPA now computes the input requirements for each crop given the yield level decided in phase two[105/]. For each crop and land type, the system relates a given level of yield to unit (per hectare) consumption of factor inputs (seed, fertilizer, pesticide and power). Given the land type and a certain level of yield, a unique combination of factors can be used. The total power required, thus projected, is expressed in man-days equivalent. The share of labour, animal and tractor power (by land type) in this total is part of the decision making".

324. Within the overall framework for population, economic, agricultural production and trade as constructed in the first two phases of the CAPPA scenario building process, the third and final phase of the CAPPA system analyses the results of the entire scenario to ensure consistency (in terms of the plausibility of the assumptions made in the preceding seven modules vis-a-vis planning the agricultural sector as an integral aspect of the overall development planning strategy for a given plan period).

325. The objective of this final phase in ASA is to provide new information to enable planners arrive at a well documented assessment of the plausibility of the entire scenario viewed technically, socially and economically. This examination of the policy options in the sector is handled by the last three modules in the CAPPA system (ie. CAPLAB, CAPECO, and CAPNUT).

[Analysis of Agricultural Labour force: CAPLAB]

326. The CAPFAC module had provided separate estimates for the demand of agricultural labour force; the supply was a priori projected in relation to total active population projections in CAPPOP. The distribution of labour inputs among land classes was determined in the CAPVGT module. The comparison of labour force requirements with the a priori projections of labour force availability in the

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105/ Chandan Mukherjee, "Agricultural planning with specific reference to CAPPA", International symposium on population and development planning, Riga,Latvian SSR, 4-8 December 1989.

sector is complemented (in CAPLAB) with the analysis of the seasonal distribution of labour requirements and the contribution of active population groups to the labour supply.

327. In effect, CAPLAB provides additional indicators which help in assessing where and how opportunities exist for modifying the labour demand situation in the sector. CAPLAB is used to effect detailed analysis of the projections of the agricultural labour force106/.

328. It compares demand/supply of agricultural manpower and displays (i) labour demand by crop and land class thus permitting an identification of the major sources of agricultural employment; and, (ii) labour demand by calendar month thus permitting an assessment of the possible gaps and bottlenecks. It also measures the respective effects, on labour demand, of changes in harvested area and of changes in yields. Finally, it permits a comparison of labour demand (technical requirements) and supply (agricultural labour force) by age-sex thus allowing for differing work capacities of the relevant sub-populations.

329. As indicated in the Technical Manual, in order to highlight those subsectors that determine labour creation/saving simultaneous with checking on the labour demanded in the agricultural sector, CAPLAB displays the sector's employment situation from several angles:

(i) the seasonal pattern of labour requirements of the sector are defined per crop107/;

106/ For the CAPLAB module the specified input requirement comprise - the effective number (base and horizon year) of the agriculturally active population in sub-sectors of forestry and fishery; - the effective number (base and horizon year) of employees necessary for livestock activities; - seasonal employment coefficients by crop (only if one wants to introduce seasonality hypotheses different from those in the data base); - distribution of the active population by category and annual lease of work in each category (status, age, sex). These data derive from (i) CAPPOP (agricultural labour force is projected on the basis of a priori demographic trends and CAPFAC (the implications of crop production scheme in terms of employment are derived on the basis of technological assessments). The only specific table in CAPLAB is the monthly distribution of labour; the default data base table gives an even monthly distribution for all crops (the planner may build an alternative table); the same is stored in the scenario file (horizon distribution).

107/ If the area harvested (HA) and the yield of a given crop (Y) in a given land class and L(Y) is the labour per hectare at the yield level Y, then the change in labour requirements between the base and horizon years (VL) can be determined from the relation:

$$VL = HA_1 [L(Y_1)] - HA_0 [L (Y_0]$$

where 0 and 1 represent the base and horizon year values respectively; whence the change due to area (VLA), the change due to yield (VLY) can be determined from the relations:

(ii) the impact of inappropriate cropping practices on labour requirements (eg. intensified cultivation resulting from use of less crop area and more modern inputs such as fertilizer, tractors), is analyzed by comparing the horizon's change in labour needs for a given crop and land class with unchanged output emanating from variation in crop area as against yield;

(iii) the study of unemployment in the sector is analyzed by comparing the projected agricultural labour force with the projected labour requirements in (i);

(iv) to absorb the estimated level of underemployment in agriculture by increased employment in other sectors, the (base\horizon year) growth rate of non-agricultural sector employment (ie. the growth differential between non-agricultural and agricultural active population) would have to be changed; and,

(v) the average level of activity in the sector is then determined by projecting the number of workers per group (ie. age, sex, status, etc) by duration of work per group thus ascertaining the average duration of work.

330. The menu of CAPLAB comprises (i) display of labour demand (D); (ii) examine area/yield components (X); (iii) display/modify seasonal demand; and, (iv) adjust supply to demand. In (iii), if the planner opts to modify the seasonal (ie. January, February, ... December) demand (day/ha), he/she supplies a new value for the January/November period and the system computes the December value. Regarding (iv), by changing any value in the input area as indicated in the Technical Manual [ie. duration of agricultural labour (days/year, agricultural employment (k) and open unemployment (k)], the system effects the necessary changes in the labour supply (kmde).

[Analysis of economic indicators :CAPECO]

331. The second module in this last phase, CAPECO measures the agricultural investment necessary for a given scenario and permits the study of foreign trade with prices different from those in the data base108/. Essentially, the

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$VLA = \frac{1}{2} [HA_1 - HA_0][L(Y_1)+L(Y_0)]$

$VLY = \frac{1}{2} [L(Y_1)-L(Y_0)][HA_1+HA_0]$; it being understood that

$VL = VLA + VLY.$

Let HA * Y be the output produced. If the area is changed by DA, then a change in yield DY is required to keep the production unchanged. Let LL(Y) be the change in per hectare labour requirements when the yield level changes by say 1 unit from the level Y. The variation in labour (DL) is given by the relation:

$$DL = HA * L(Y) - [HA + DA] * DY * LL(Y).$$

108/ For the CAPECO module, the specified data input requirement comprise : (i) land development investments : transition matrix (areas changing land class between base and horizon year); - investment unit cost by hectare - the share of public finances - the share of foreign currency. (ii) mechanization

module handles three aspects of policy analysis namely investment, trade and value added. Accordingly, the module has three submodules; the first of these computes the investment requirements ; the second completes the analysis of foreign trade in factors of production and permits the use of updated foreign trade prices in the computation of the net balance; and, the third computes value added per crop on the basis of projected yields and factor inputs consumption. Based on the latter, the projected sector value added is then computed and thence compared with ex-ante macro-economic projections.

332. Thus the menu of CAPECO comprises (i) analysis of investments (I); (ii) analysis of foreign trade (T); and, (iii) analysis of value added (V).

(i) **Analysis of Investment**

333. The sub-module analyses three aspects of agricultural investment (land/water development, mechanization, and livestock)109/ required for reaching the targeted situation in the horizon year. Investments in land and water development, buildings and mechanization as well as livestock growth can be derived from already established projections using costs information provided by the planner. He/she has to indicate from which land class (in the base year) the increases in area of other land classes are to be found.

334. The Technical Manual indicates that investment in mechanization depends upon the change in the numbers of tractors over the plan period. The planner has to indicate the replacement rate of tractors as well as the unit cost of a tractor, the share paid in foreign exchange and the cost of the auxiliary materials for the tractors.

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investments
- the replacement rate - one tractor unit cost - the share of foreign currency in the base and horizon year - the relative cost of accessory equipment in % - their cost in currency in the base and horizon year; (iii) Livestock investment (for each livestock system) - the replacement rate (dead animals to be replaced) - investment cost for unit system - the share of this cost in currency for the base and horizon year; (iv) For the analysis of foreign trade - for each product imported and exported: price FOB (CAF); - for each chemical input: the share imported; the CAF price; (v) For global value added - the unit price of animal and tractor utilization; the percentage to be added to inputs calculated for other non-specified costs.

109/ Nearly all data required by the CAPECO module derive from earlier modules. The S/U A come from CAPSUA, consumption of factor inputs from CAPFAC, land resources in the horizon from CAPVGT, livestock numbers from CAPANM, and comparative macro-economic data from CAPMAC. Additionally, the module uses prices or unit costs from the data base or the user.

335. Investment in livestock is calculated for every production system as for mechanization.

336. Upon entering (I) in the CAPECO module, the planner is given four options: to analyze land development investments (L); to analyze mechanization investments (M); to analyze livestock investments (S); and, to summarize investments (U).

(ii) **Analysis of value added [per crop)**

337. This is calculated using the accounting prices in the data base together with the quantities per hectare as from CAPVGT and CAPFAC. The growth rate of the aggregated value added (over all commodities) is thence compared with that derived from CAPMAC (as a test of the data system).

338. Upon entering (T), the planner is provided with three options: value of net production (P); aggregate added value (A); and, diagram value added/crops (D).

(iii) **Analysis of Foreign Trade**

339. CAPSUA provides information on foreign in agricultural commodities valued at data base prices. CAPECO can be used to value it at different FOB and CIF prices.

340. Upon entering (V), the planner is provided with three options: commodities (C); factor inputs (F); and, global balance (G).

[Analysis of the nutritional situation: CAPNUT]

341. The last module in this third phase, CAPNUT, analyses the nutritional situation resulting from the scenarios projections. The average per capita, per day nutrients availability is computed on the basis of the food demand projections (CAPDEM) with a food composition table contained in the country's data base. Nutrients availability for the total, urban/rural sectors population is obtained provided valid sectoral demand projections enable the later estimates. The standard list of nutrients includes calories and proteins and other components such as glucids and lipids.