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**AGRICULTURE
IN
KABUPATEN LUWU**

**CHECCHI AND COMPANY
PROJECT LUWU
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CHAPTER I
AGRICULTURE IN KABUPATEN LUWU

1.1 Existing Land Use

According to figures obtained from the Statistical Office in Palopo (Table 1.1), there were 132,409 hectares of land developed to agriculture and a further 92,939 hectares of land which could be converted to agriculture in 1980. The Master Plan for Irrigation Development in the North Luwu Plain¹, however, estimated in 1975 that out of a total area of 800,000 hectares (approximately 32 per cent of the total land area in the Kabupaten), there were 193,000 hectares which were cultivable of which 100,000 hectares were irrigable. The total gross cultivable area was made up of an estimated 27,800 hectares of already cultivated and potentially irrigable land, 54,500 hectares of forest, 52,950 hectares of secondary forest and scrub, and 57,750 hectares of cultivated or cultivable but non-irrigable land. Taking these last three categories, the potential cultivable land in the North Luwu Plain alone according to these estimates, ranged between 107,450 hectares and approximately 150,000 hectares in 1975, depending on what proportion of the 57,750 hectares had not yet been cultivated.

The North Luwu Plain lies within the 7 kecamatan of Walenrang, Sabbang, Masamba, Malangke, Bone Bone, Wotu and Mangkutana. The total land area in these kecamatan is 1,222,000 hectares (or 49 per cent of the total land area in the Kabupaten), of which according to the 1980 Survey, 58,918 hectares were cultivated and 11,530 hectares were urban land leaving a balance of 1,159,452 hectares. The survey estimates that of this total only 47,098 hectares (52 per cent of total potential agricultural land) is potentially convertible to agricultural use.

On present estimates 44 per cent of total and is under forest and 46 per cent is classified as other land. Much of the forest-land is mountainous while much of the "other" land will be swamp, which considerably limits the potential for conversion to agriculture. It is also present policy to conserve as much of the forest as possible. But given all of these limitations it would appear that present estimates of the land which has agricultural potential are on the low side, particularly in view of the much larger 1975 estimates for the North Luwu Plain alone. On present plans for irrigation development there, plus those to develop approximately 14,000 hectares of oil palm estates, approximately 60,000 hectares of primary of forest land will be converted to agriculture by the year 2000.

Present estimates of potential agricultural land must therefore be taken as somewhat tentative until a new land use study has been undertaken and current land use and land capability maps have been produced. Until these are available it is not possible to state with any degree of

Note ¹DHV Consulting Engineers and ILACO March 1977.

precision what area of forest, grassland and other land is potentially convertible to agriculture use. Conversion of forest to agriculture will also depend on how the conflicts between the demand for agricultural land and the need to preserve forest are resolved, and on whether areas designated for timber production are felled on a sustained yield basis or not.

Table 1.1

LAND USE AND POTENTIAL AGRICULTURAL LAND KABUPATEN LUWU 1980

Kecamatan	Total Area	Urban	Agri-Culture	Grass/Pasture	Potential Agri-culture	Forest	Other
	(..... In Hectares.....)						
Laronpong	36,000	134	10,517	0	878	18,573	6,776
Suli	20,000	419	6,148	1,071	527	605	11,757
Bajo	59,200	2,297	10,844	626	1,075	470	44,963
Bastem	325,000	1,716	12,875	38,875	18,002	142,650	128,884
Bupon	75,000	1,701	16,651	625	1,938	33,078	22,945
Wara	19,000	2,578	2,954	1,700	810	8,000	3,768
Walenrang	183,000	2,800	17,317	1,350	5,605	101,861	59,672
Sabbang	241,400	193	3,862	98	8,361	179,578	57,669
Limbong	244,300	202	9,948	3,668	0,359	41,605	188,877
Masamba	274,000	1,038	11,084	52,615	18,287	47,376	161,887
Malangke	80,000	1,533	4,520	1,520	2,106	14,619	57,873
Bone Bone	63,200	2,437	5,838	0	1,664	28,271	26,654
Wotu	177,300	910	6,048	10	6,052	132,153	38,179
Mangkutana	211,000	2,619	10,249	223	4,483	23,447	174,462
Malili	215,500	1,843	2,305	380	6,002	84,402	126,570
Nuha	291,000	399	1,249	921	10,779	239,003	49,428
Kabupaten Luwu	2,514,900	22,819	132,409	103,617	92,939	1,095,691	1,160,364
	100.0%	.9%	5.3%	4.1%	3.7%	43.6%	46.1%

Note: Present estimate of Potential Agricultural land is based on 25% of pasture, 4% of forest, and 2% of other.

Source: Survey Potensi Desa 1980, Statistical Office, Palopo

The future amount of livestock reared on the grasslands and the area of the latter which can be potentially converted to other forms of agricultural use, will also depend on future livestock policy. A study is being undertaken at the moment to determine the potential nutrient status of the grasslands of South Sulawesi, by examining both the possibilities of improving existing grasses and of introducing exotic species of grasses and legumes. Until this study is completed and the results combined with general land use studies, neither the area of grassland which can be used for livestock rearing nor the area which can be developed to other agricultural activities can be determined.

The general conclusions which can be drawn from present evidence on land use, is that in the longer term there is a considerable amount of land available for agricultural expansion should policy so dictate. In the shorter term the main area of expansion is likely to be in the North Luwu Plain. At the end of 1983, approximately 85,000 hectares of land, some of which is already cultivated, will remain to be developed to irrigation under the Master Plan, while approximately 14,000 hectares of largely forest land is being converted to oil palm over a 7 year period, by PNP 28 in Bone Bone. It is expected that 9,000 hectares of oil palm will be planted by 1987 and 14,000 hectares by 1990.

1.2 Soils, Climate and Topography

1.2.1. Soils

The only semi-detailed soils analyses available for the Kabupaten are those carried out by the Master Plan study in 1975 and by the North Luwu Micro Economic Study in 1976. The Master Plan was primarily interested in classifying the suitability of the soils in the North Luwu Plain for rice cultivation under irrigation and gave the following classification.

Table 1.2

LAND CLASSIFICATION FOR WETLAND RICE CULTIVATION NORTH LUWU PLAIN

Soil Class	Classification	Area (Ha)
I	Very suitable	-
II	Suitable	81,250
II/III	Mixture of suitable and marginally suitable	48,000
IV	Conditionally suitable	9,400
V	Unsuitable	29,500

Generally the soils were found to be low in organic matter and nutrient content which would require high dosages of nitrogen and phosphates to be applied if rice were to be double cropped under irrigation. There was also a possibility of iron toxicity under double cropping and in order to avoid this, good drainage would be essential so that the fields could be completely dried before harvest. The soils survey also found the soils slightly less suitable for continuous cultivation of crops such as maize and soya beans, due to a rather high silt content which could cause poor aeration of the soil and possibly sheet erosion.

The North Luwu Micro Economic Study¹ came to the conclusion from their examination of the soils in North Luwu that, with some exceptions, they were not in general very fertile, and that in many of the sawah areas, high permeability would present a problem for irrigation. In many of the potential annual dryland cropping areas the soils were of light texture and where topography was

Note 1 Institut Pertanian Bogor February 1976

unfavourable terracing would be required. These problems were not thought to be insurmountable, but in general cultivation would require adequate fertilization and a plentiful supply of water under irrigated conditions and adequate fertilization, careful cultivation and careful husbandry techniques under dry land conditions.

1.2.2. Topography

Much of the Kabupaten is mountainous and topography is a limiting factor on expansion of particularly annual cropping and, to a large extent, on perennial cropping by smallholders. The latter have already expanded both forms of cropping particularly in the southern part of the Kabupaten on steep to very steep land, which in the interests of soil conservation and sound watershed management should be left uncultivated. Although commercial estates can with proper practices plant perennial crops on slopes up to 40° where slope length and soil depth and texture are suitable, present policy discourages smallholders from planting perennial crops on slopes above 15° and annual crops on slopes above 5°. Annual crops can be planted on slopes up to 7° provided terracing and grass stripping is undertaken but these are difficult tasks for a smallholder to carry out effectively.

1.2.3. Climate

The climate in the Kabupaten is generally favourable for rainfed agriculture. Annual rainfall is 1,736 millimeters in the southern part of the Kabupaten and increases as it moves northwards to a maximum of 3,611 millimeters at Masamba. It is reasonably evenly distributed throughout the year with the highest precipitation generally in the April-May period and the lowest in September and October. Monthly precipitation does however vary considerably from year-to-year and short drought periods frequently occur so that the planting of annual crops under rainfed conditions involves a certain amount of risk. There are no indications that day length places any limits on annual crop yields but a high variability in solar radiation could be a limiting factor.

1.3. Existing Agriculture

1.3.1. Food Crops

In relation to other Kabupatens in the Province, Luwu is a major producer of rice and in 1980 had by far the largest area of dry land rice (Padi Ladang) at 9,244 hectares, compared with the next largest area of 3,098 hectares in Bone¹. It also had the fifth largest area of wet padi land comprising 53,317 hectares in 1980, compared with 80,296 hectares in Bone and 67,737 hectares in Wajo. Of this area 24,029 hectares were cropped in the off season and this area was only exceeded in Pinrang where 33,448

Note: ¹ Statistical Year Book of South Sulawesi.

hectares were cropped in the same season. In terms of yield the Kabupaten in 1980 obtained the provincial average at 1.9 tons per hectare for dryland rice, slightly below the average of 3.99 tons at 3.37 tons for main season sawah rice, and at 3.33 tons for off season sawah rice, was well below the provincial average of 4.99 tons per hectare.

After rice, maize is the next most important annual crop in terms of area cultivated which has fluctuated between 1977 and 1980; rising from 3,343 hectares in 1977 to 4,738 hectares in 1978, falling to 3,303 hectares in 1979 and rising again to 4,120 hectares in 1980. The latter area was the thirteenth largest area of maize cultivated in the province in 1980 and ranked well behind Bone with 99,737 hectares, Soppeng with 35,103 hectares and Sinjai with 29,896 hectares. The yield in 1980 at 0.74 tons was below the provincial average of 0.82 tons.

Soya bean is the third most important food crop in the Kabupaten where 2,424 hectares were cultivated in 1980. This was the fourth largest area in the province compared with 4,591 hectares in Soppeng, 3,739 hectares in Bone and 2,799 hectares in Mamuju. The area cultivated fluctuated considerably in the Province as a whole between 1977 and 1980, varying from 11,125 hectares in 1977 to 20,713 hectares in 1979 but subsequently declined to 17,619 hectares in 1980. A similar fluctuation occurred in the Kabupaten where area cultivated rose from 1,948 hectares in 1977 to 4,383 hectares in 1979 and declined to 2,424 hectares in 1980. According to provincial statistics yield per hectare in Luwu did not increase significantly between 1977 and 1980, and at 0.72 tons in 1980, was close to the provincial average of 0.73 tons per hectare.

The area of groundnuts cultivated rose from 1,225 hectares in 1977 to 2,924 hectares in 1980, the fifth largest area in the province. This was well behind Bone with 19,577 hectares, approximately half the area of Senjai with 5,813 hectares and approximately 60 per cent of Bulukumba with 5,019 hectares. Yields in 1980 at 0.64 tons per hectare were below the provincial average of 0.72 tons per hectare.

The area of cassava cultivated declined slightly from 1,597 hectares in 1977 to 1,371 hectares in 1980 when Luwu had the sixth largest area cultivated compared with 5,544 hectares in Jeneponto, 4,933 hectares in Tana Toraja, 4,917 hectares in Gowa, 4,192 hectares in Bulukumba and 2,652 hectares in Polmas. According to figures in the provincial statistics, yields at 4.5 tons per hectare in 1980, were considerably below the provincial average of 7.6 tons per hectare.

1.3.2. Area Production and Yield of Food Crops

1.3.2.1. Area

As can be seen from table 1.3 cultivation of rice is the predominant annual agricultural activity in the kabupaten. The area cultivated to rice increased by 81 per

cent between 1977 and 1981 and accounted for approximately 80 per cent of annual area cropped throughout that period. The area of maize cultivated increased by 58 per cent while that of cassava, sweet potato and groundnut declined. The largest percentage increases in area cultivated were for mung bean, fruit and vegetables. The figures for the latter two crops appear to be very unreliable but it is likely that there was considerable increase in some annual fruit cultivation such as banana and papaya with the arrival of transmigrants. Approximately 60 per cent of the present transmigrant population, which started arriving in 1971, arrived between 1973/1974 and 1977. These are mostly of Javanese and Balinese origin who traditionally plant bananas as part of the cropping pattern when opening up new land and who practice intensive cultivation of fruit and vegetables around the house lot. Such plantings could account for the considerable increases in fruit and vegetable areas in certain years after 1975. There is also considerable inter-cropping of bananas with young clove trees particularly in the south of the Kabupaten. According to figures available production of mango and durian showed considerable increases between 1980 and 1981, which might indicate a growing commercial market for hard fruit.

Table 1.3

HECTARES HARVESTED OF FOOD CROPS KABUPATEN LUWU 1975-1981
(Hectares)

	1975	1976	1977	1978	1979	1980	1981	% In-crease
Padi	35,907	44,017	43,042	56,231	61,717	62,471	65,068	81
Maize	3,325	2,201	1,990	4,556	3,576	4,120	5,257	58
Cassava	2,236	1,396	1,597	1,695	1,788	1,371	1,774	-21
Sweet Potato	1,146	846	1,058	849	959	873	680	-41
Groundnuts	907	636	1,225	1,914	1,005	2,924	935	3
Soya Bean	2,538	1,519	1,948	2,957	4,300	2,424	1,804	-29
Mung Bean	287	123	313	163	308	355	704	145
Fruit	459	474	530	369	585	749	1,557	239
Vegetables	438	375	611	648	1,555	1,487	2,197	402
Total	47,253	51,587	53,336	69,582	76,793	77,774	79,977	69
Padi as % total	76%	85%	78%	81%	90%	81%	81%	

Source: BAPPEDA, Palopo

1.3.2.2. Production

Table 1.4 once again underlines the predominance of rice in the food crops economy, with production growing by 98 per cent between 1975 and 1981 and on average accounting for 86 per cent of total food production during that period. Maize production grew by 126 per cent and mung beans by 304 per cent, but from a low base of 136 tonnes. The other major annual food crops declined slightly, the largest

decline being for sweet potato at 28 per cent. The figures for fruit and vegetables are probably not reliable as it is extremely difficult to collect accurate production data on small scattered production units where polyculture is common and any saleable production is sold direct to numerous small local market outlets.

Table 1.4

PRODUCTION OF FOOD CROPS KABUPATEN LUWU 1975-1981
(tonnes hectares)

	1975	1976	1977	1978	1979	1980	1981	% In-crease
Padi	11,173	152,179	147,219	178,321	151,209	196,898	221,538	98
Maize	2,127	1,339	1,909	3,501	2,468	3,087	4,811	126
Cassava	12,253	7,347	9,295	8,659	7,621	7,670	11,708	-4
Sweet Potato	4,034	3,489	4,770	3,517	4,127	4,236	2,885	-28
Groundnuts	547	389	778	1,257	1,472	1,869	507	-7
Soya Bean	1,473	989	1,369	1,956	3,177	1,738	1,333	-95
Mung Bean	126	54	170	94	196	221	509	304
Fruit	2,419	3,758	3,998	4,231	2,883	3,695	12,095	395
Vegetables	2,131	1,767	3,720	5,944	3,726	4,837	3,683	73
Total	137,149	171,409	173,228	207,879	176,879	224,301	257,069	89
Padi % of total	80%	89%	85%	86%	85%	88%	86%	

Source: BAPPEDA, Palopo

1.3.2.3. Yield

Table 1.5 shows yields for the major food crops derived by dividing production figures by the figures for area cultivated. These produce slight variations from the figures given in The Statistical Year Book of South Sulawesi, but the order of magnitude is the same except in the case of cassava, where the yield obtained by this method is 5.59 tons per hectare in 1980 compared with the figure of 4.5 tons in the Statistical Year Book. Although average yields calculated on this basis remain well below potential yields for most of the annual crops grown, particularly rice, a clear tendency is evident, except in the case of groundnut, of increasing average yield, particularly in the 1978 to 1981 period; the most significant increases being in mung beans, maize and soya bean.

1.3.2. Perennial Crops

The most important perennial crops in the Kabupaten are coconuts, coffee and cloves the last having been extensively planted since the mid-seventies. Other perennial crops, which are largely being introduced as a diversification programme to smallholders, are nutmeg, black pepper, cocoa, candlenut and tobacco which although an annual crop, because it is an industrial crop, is classified as an estate crop and therefore included in the perennial cropping programme.

Table 1.5

FOOD CROP YIELDS KABUPATEN LUWU
(Tons Hectare)

	1975	1976	1977	1978	1979	1980	1981	% In- crease
	----	----	----	----	----	----	----	-----
Padi	3.10	3.50	3.40	3.20	2.50	3.20	3.40	
Maize	0.64	0.61	0.64	0.77	0.69	0.75	0.92	10
Cassava	5.62	5.26	5.8	5.11	4.26	5.59	6.60	44
Sweet Potato	3.52	4.12	4.5	4.14	4.3	4.9	4.24	17
Groundnuts	0.60	0.61	0.63	0.66	0.73	0.64	0.54	20
Soya Bean	0.58	0.65	0.70	0.66	0.74	0.72	0.74	-10
Mung Bean	0.44	0.44	0.54	0.58	0.64	0.62	0.72	28
Fruit	5.30	7.9	7.3	7.4	4.9	11.9	7.7	64
Vegetables	4.87	4.71	6.10	6.53	2.4	1.9	1.68	-

Source: BAPPEDA Palopo

The area of these crops is, however, very small at present; often comprising no more than the introduction of a few seedlings to individual farmers, or as in the case of tobacco, only introduced to one or two areas. The area of perennial agriculture is broken down into small estates which are comprised of smallholders growing small lots of perennial crops or even perennial crops such as coconut and cloves around the home lot. Large estates comprise larger areas of commercially oriented farming and are mainly confined to coconut and coffee. There is no breakdown available showing the respective areas of these two categories by crop but according to Dinas Pertanian figures there were 41,677 hectares of small estates and 13,444 hectares of large estates, with approximately 54 per cent of the latter located in Bastem.

These totals however do not coincide with the total figures given in table 1.6 of 35,234 hectares which are Dinas Perkebunan figures of the acreage of perennial crops in 1980. The figure in table 1.6 show that coconut growing is fairly evenly distributed throughout the Kabupaten with the largest area of 2,240 hectares in Bupon. Coffee is also grown throughout the Kabupaten but 46 per cent of the cultivated area is in Bastem and 83 per cent of the cultivated area is in Bastem, Sabbang, Limbong, and Bone Bone. Cloves are also grown throughout Luwu but cultivation is very much concentrated in the three most southerly Kecamatan of Bajo, Suli, and Larompong, the latter accounting for 54 per cent of the total cultivated area, according to the figures available.

Table 1.7 presents the figures available on perennial crop production from 1975-1981, which show fairly static production of coconuts during that period and coffee production which was static between 1975 and 1978, declined sharply in 1979 and began increasing again in 1980 and 1981.

Table 1.6

AREA OF ESTATE CROPS 1980
KABUPATEN LUWU
(Hectares)

	<u>Groundnut</u>	<u>Coffee</u>	<u>Cloves</u>	<u>Nutneg</u>	<u>Pepper</u>	<u>Cocoa</u>	<u>Tobacco</u>	<u>Candlenut</u>	<u>Total</u>
Larompong	755	32	9,052	2	5	8	-	30	9,852
Suli	596	32	2,941	3		54	-	21	3,647
Baj	1,574	46	1,179	36	27	260	4	328	3,454
Bastem	7	1,768	58			5	-	39	1,877
Bupon	2,240	18	125	9	11	350	10	59	2,822
Wara	249	68	32	5		42	-	11	407
Walenrang	1,207	35	891	1	7	21	-	35	2,197
Sabbang	848	531	389	-	15	51	-	18	1,852
Limbong	6	351	52	-	-	-	-	-	414
Masamba	687	169	142	1	18	4	5	-	1,028
Malangke	1,012	60	-	-	-	-	-	7	1,072
Bone Bone	1,560	468	457	2	28	10	-	-	2,545
Wotu	1,390	152	713	6	5	7	-	20	2,273
Mangkutana	195	138	183	40	133	17	-	-	706
Malili	324	48	69	-	-	1	-	-	442
Nuha	148	3	417	1	79	2	-	-	650
Total	12,798	3,887	16,700	106	328	832	19	568	35,238

Source: BAPPEDA Palopo

Total production of the main perennial crops in the Province by smallholders in 1979 was 67,728 tons of coconut, 6,475 tons of coffee and 91 tons of cloves.

Table 1.7

ESTATE CROP PRODUCTION KABUPATEN LUWU 1975-1981 (Metric Tonnes)							
	1975	1976	1977	1981	1979	1980	1981
Coconut	7,347	7,712	7,745	8,242	6,350	7,440	7,825
Coffee	995	962	977	981	555	795	830
Cloves	na	na	na	na	na	39.1	72.3
Nutmeg	na	na	na	na	na	0.3	1.0
Black Pepper	16.1	16.2	16.5	16.5	10.0	7.2	11.70
Cocoa	na	na	na	na	na	0.7	5.32
Tobacco	25	24	15	17	6	1	3.3
Candlenut	na	na	na	na	na	2.9	32.0

na not available

1.3.3. Livestock

There have been very considerable percentage increases in the numbers of livestock between 1975 and 1982. Some of these increases have been due to livestock imported by transmigrants, but on the whole these additions have been relatively small, and the largest increases have come from growth of the indigenous livestock population. According to the figures in table 1.8 the pig population grew by 261 per cent, that of poultry by 234 per cent, cattle by 218 per cent, goats by 177 per cent and buffalo by 105 per cent, during the period 1975 to 1982.

Luwu is, however, a relatively minor producer of livestock, accounting in 1980 for approximately 8 per cent of the pig population, 7 per cent of the buffalo population and 5 per cent of the cattle population within the Province.

1.3.4. Fish Farming

The area of fresh and brackish water ponds and padi fields developed for fish farming in Luwu amounted to 7,800 hectares in 1980 with a total production of 2,360 tons. Of this total 519 tons were caught in open water, 584 tons were produced from brackish water culture, 411 tons from fresh water culture and 811 tons from padi fields.

Total production for the province between 1977 and 1981 is shown in table 1.9.

Table 1.8

LIVESTOCK POPULATION KABUPATEN LUWU
1975 - 1982
(Head)

	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	% Increase
Horses	905	933	1,500	1,995	1,980	2,172	2,217	145
Buffalo	16,280	21,086	22,423	26,328	26,319	30,065	33,347	105
Cattle	na							
Local	na							
Transmigrant	na							
Total	17,653	21,688	25,265	36,780	36,012	39,830	50,733	
Goats					3,412	4,658	5,471	
Local					39,424	44,488	56,204	218
Transmigrant	na							
Total	6,676	7,521	7,521	10,342	10,403	11,776	13,517	
Pigs					817	1,064	1,124	
Local					11,217	12,840	14,361	117
Transmigrant	na							
Total	11,260	12,015	13,279	22,956	17,376	20,881	34,539	
Poultry					4,873	6,034	6,064	
Local					22,249	26,915	40,603	261
Transmigrant	na							
Total	303,207	413,261	448,370	630,702	602,688	665,364	851,136	
					118,233	162,073	162,075	
					720,920	827,437	1,013,211	234

Source: BAPPEDA Palopo.

Table 1.9
INLAND FISH PRODUCTION SOUTH SULAWESI 1977-1981
(Tonnes)

Variety	1977	1978	1979	1980	1981
Red Prawn	2,366	2,969	3,920	3,393	3,883
White Prawn	1,273	1,212	1,545	1,476	1,519
Milk Fish	16,230	16,399	15,494	15,980	17,811
Other	4,487	3,982	4,686	5,270	4,768
Total	24,320	24,562	25,645	26,119	27,981

Source: Dinas Perikanan Ujung Pandang

Of the total provincial production in 1980, 80 per cent were cultured fish, 60 per cent of which were produced in brackish water ponds.

.4. Present Farming Systems

Apart from the evidence of small sample surveys in the North Luwu area, there is little statistical evidence on the types of farming systems found in the Kabupaten. Table 1.10 shows the various amounts of land cultivated according to crops grown in the 16 Kecamatan in the Kabupaten. On this evidence annual cropping on wet rice land is considerably greater than annual cropping on dry land in all Kecamatan except Larompong, Wotu and Mangkutana. When the area of perennial dry land cropping is added to the area of annual dry land cropping, however, dry land farming predominates in 8 Kecamatan, particularly Larompong, Bastem, Limbong, Masamba, Wotu, Mangkutana and Malili.

The Master Plan for Irrigation Development for the North Luwu Plain, found in 1975 that the 32,000 families in the 7 Kecamatan of Walenrang, Sabbang, Malangke, Masamba, Bone Bone, Wotu and Mangkutana, cultivated on average 0.4 hectares of sawah and 0.62 hectares of dry land crops. The dry land area comprised an average 0.23 hectares of homeyard, 0.2 hectares of shifting cultivation, 0.08 hectares of permanent annual cultivation and 0.11 hectares of perennial cultivation.

The North Luwu Micro Economic Study conducted a more detailed study in 1976 on farm types in the Lamasi, Bone Bone and Kalaena irrigation areas, with a sample survey of 371 farmers. The results of this study, shown in table 1.11, indicate that in Bone Bone and Kalaena upland farming predominated in terms of land ownership, but in Lamasi which is in Walenrang, the Kecamatan with the largest sawah area in the Kabupaten, sawah land predominated.

Table 1.10

CULTIVATED LAND KABUPATEN LUWU 1980
(Hectares)

Kecamatan	Wet Rice Land (1)	Dry Land Annual (2)	Perennial Small Estates (3)	Perennial Large Estates (4)	Total Dry Land 2+3+4+5	Fish Ponds (6)	Total 1+5+6
Larompong	1,402	1,425	6,860	0	8,285	830	10,517
Suli	3,595	392	1,836	0	2,228	325	4,148
Bajo	5,850	668	3,598	0	4,266	728	10,844
Bastem	1,050	200	4,376	7,249	11,825	0	12,875
Bupon	8,401	410	4,854	1,082	6,346	1,904	16,651
Wara	897	137	1,340	500	1,977	80	2,954
Walenrang	11,224	630	4,313	600	5,543	550	17,317
Sabbang	2,995	86	621	100	807	60	3,862
Limbong	1,928	1,425	4,675	1,338	7,438	582	9,948
Masamba	4,754	750	4,560	1,000	4,310	20	11,084
Malangke	1,500	594	10	0	604	2,416	4,520
Bone Bone	3,988	290	960	545	1,741	109	5,858
Wotu	1,368	2,366	1,772	475	4,613	67	6,048
Mangkutana	3,448	6,350	427	15	6,792	9	10,249
Malili	450	175	1,094	525	1,794	61	2,305
Nuha	586	153	435	15	603	60	1,249
Total	53,346	16,051	41,677	13,444	71,172	7,801	132,409

Source: Dinas Pertanian

Table 1.11

AVERAGE OWNERSHIP OF LAND OF SAMPLED
FARMERS IN NORTH LUWU
1975

	Average Survey Area		Lamasi		Bone Bone		Kalaena	
	Ha.	%	Ha.	%	Ha.	%	Ha.	%
Sawah	0.53	38	0.78	53	0.44	35	0.77	39
Upland	0.85	82	0.69	47	0.82	65	1.17	61
Total	1.38		1.47		1.26		1.94	

Further evidence from 6 villages in Walenrang tends, to confirm predominance of sawah cultivation in the Kecamatan; see table 1.12. In only one of the six villages surveyed, Lamasi Pantai, did dry land cropping greatly exceed sawah cropping.

Table 1.12

SAWAH AND UPLAND CROPPING IN SIX VILLAGES
IN KECAMATAN WALENRANG 1978

	Sawah Area	Upland Area
	(Hectares)	
Bolong	1,163	412
Lamasi Pantai	665	1,301
Lamasi	1,530	794
Seriti	1,033	224
Han Batu	125	212
Lempepasang	160	176

Source: Kecamatan Office, Walenrang and Agro Economic Survey, Rural Dynamics Study, Bogor, Indonesia.

Actual utilization of land is related to the irrigation status of the sawah areas. The Impact Evaluation of Luwu Area and Transmigration Development Project by the University of Hasanuddin research team, found that when full irrigation is provided the major portion of the net farm income and net household income comes from rice farming; and that when off farm employment is available this is substituted for income earning opportunities from the cultivation of other crops.

On the rather limited evidence available it can be concluded that most farmers in the Kabupaten carry out a mixture of farming activities. In terms of annual cropping, sawah cultivation predominates, since on the present evidence, only in Wotu and Mangkutana does the annual dry land cropped area significantly exceed that of sawah. In areas where sawah land is scarce, particularly Larompong, Bastem, Limbong, Wotu and Malili, perennial cropping becomes important and in total, dry land farming predominates.

1.4.1. Irrigation Status

According to information available from Dinas Pertanian, out of a total sawah area of 53,436 hectares in 1980, fully controlled irrigation to the tertiary level was available on 3,266 hectares while 212 hectares were controlled to the secondary level only. The balance was made up of village irrigation systems amounting to 35,970 hectares and of rainfed sawah amounting to 13,988 hectares.

The village irrigation systems are normally constructed by farmers themselves and consist of a diversion weir feeding a primary channel from which secondary offtakes divert water to the sawah area. Many of these systems are in poor condition, suffering from broken weirs, or insufficient head of water at the weirs, even if they are in good repair, inadequate levelling and drainage problems.

Controlled irrigation systems are designed and constructed by the Direktorat Irrigasi, Departemen Pekerjaan Umum. Village schemes are financed from provincial budget and carried out by the farmers themselves sometimes with assistance from the Camat's office under village assistance schemes. The irrigation section of the provincial Department of Public Works has the responsibility for designing and supervising the construction of small complicated irrigation schemes, which amounted to 12,600 hectares in 1982. It also has responsibility for the operation of controlled irrigation systems. Table 1.13 shows the area of sawah which comes under the responsibility of the Department of Public Works. These figures would indicate a substantially larger area of sawah than indicated by the Dinas Pertanian figures in table 1.10 and that only 26,303 hectares of present irrigation systems are fully operational.

The most important development in irrigation since 1975 has been the Irrigation Sub Project of the Luwu Area Transmigration Development Project. A loan agreement for this sub project was signed between USAID and the Government of Indonesia in October, 1975. Initially the agreement was to provide funds and technical assistance to rehabilitate and extend irrigation systems from the Bone Bone and Kalaena Rivers over an area of 10,670 hectares. This was later reduced to 8,480 hectares with a scheduled completion date of July 1983. In addition 4,472 hectares of fully controlled irrigation is being developed with Dutch technical assistance in the Pompegan area of North Luwu. These works are scheduled to be completed in August 1983, so that in total a fully controlled irrigation network of 13,100 hectares should be available in North Luwu on current plans by the end of 1983.

Table 1.13

IRRIGATION AREAS ADMINISTERED BY IRRIGATION SECTION
DEPARTMENT OF PUBLIC WORKS KABUPATEN LUWU
MAY - JUNE 1982

Kecamatan	Total Area			Functioning			Not-Functioning		
	Total	PU Areas	Non-PU Areas	Total	PU Areas	Non-PU Areas	Total	PU Areas	Non-PU Areas
Barompong	1,340	400	940	700	200	500	640	200	440
Buli	2,450	1,850	600	2,000	1,600	400	450	250	200
Bajo	8,000	7,000	1,000	1,378	828	550	6,622	6,172	450
Bastem	-	-	-	-	-	-	-	-	-
Bupon	10,255	7,000	3,255	2,638	615	2,023	7,617	6,385	1,232
Walenrang	17,850	13,950	3,900	8,485	5,905	2,580	9,365	8,045	1,320
Sabbang	5,400	-	5,400	2,010	-	2,010	3,390	-	3,390
Bimbong	-	-	-	-	-	-	-	-	-
Lamasamba	5,990	-	5,990	2,445	-	2,445	3,545	-	3,545
Malangke	-	-	-	-	-	-	-	-	-
Bone Bone	4,980	2,885	1,095	2,695	1,655	1,040	2,285	1,230	1,055
Botu	8,139	5,516	2,263	1,039	-	1,039	7,100	5,516	1,584
Mangkutana	3,663	3,163	500	3,153	3,163	350	150	-	150
Malili	-	-	-	-	-	-	-	-	-
Muha	-	-	-	-	-	-	-	-	-
Kabupaten Luwu	68,067	41,764	26,303	26,903	13,966	12,937	41,164	27,798	13,366

Source: Department of Public Works

1.4.2. Farm Characteristics

1.4.2.1. Average Farm Size

There is little data on farm size in the Kabupaten with the exception of that collected from sample surveys in North Luwu. Table 1.11 shows an average size of 1.38 hectares in North Luwu, the average size range extending from 1.94 hectares in the Kalaena area to 1.26 in the Bone Bone complex. A small sample of size frequency comparing the non-irrigated and irrigated farms in North Luwu with non-irrigated areas in Bupon and Bajo, found a size distribution range from 0.25 hectares to 6 hectares in Bupon and Bajo and from 0.25 to 3.5 hectares in the irrigated areas of Sodomukti, Margolembo and Lamasi in project Luwu. Table 1.14 shows the frequency distribution of this sample indicating that between 63 and 77 per cent of farms sampled are in the size range of 0.5 to 1.5 hectares.

In a short mission to the Pompengan irrigation project in Kecamatan Walenrang, a team from Agro Economic Survey in Bogor found that in the villages of Bolong, Lamasi, Sriti, Lamasi Pantai, Ilong Batu and Lampepasang, the average holding size was 2.6 hectares comprising 1.6 hectares of sawah and 1 hectare of dry land. They also heard that in many cases there were landowners with up to 15 hectares of sawah land.

Table 1.14

FARM SIZE DISTRIBUTION FROM SELECTED VILLAGES IN BUPON, BAJO,
BONE BONE, WALENRANG AND MANGKUTANA

	Non Irrigated				Irrigated (Project Luwu)	
	Bupon, Bajo		Bone Bone		Bone Bone, Walenrang, Mangkutana	
	No.	%	No.	%	No.	%
0.49	6	10	7	23	5	6
-0.99	10	31	8	27	28	35
-1.49	19	32	14	47	26	33
1.5	16	27	1	3	21	26

Source: Impact Evaluation of Luwu Area and Transmigration Development Project University of Hasanuddin Research Team.

1.4.2.2 Land Ownership

Table 1.15 summarizes the findings of the North Luwu Micro Economic Study on land ownership which shows that most of the farmers surveyed owned and worked their own land. In Lamasi, however, 20 per cent did not own land and a further 14 per cent had to work other peoples land in order to obtain a sufficient income.

Table 1.15

OWNERSHIP AND TENANCY STATUS OF SAMPLED
FARMERS IN NORTH LUWU 1975

Area	Lamasi	Bone Bone	Kalaena	Total
No. of Sample	50	271	50	371
	%	%	%	%
Owners	76	97	92	94
Tenants	10	2	-	2
Owner/Tenants	14	1	8	4

The Agro Economic survey team, on the other hand, found a greater degree of landlessness in their survey area of the six villages in Walenrang where 30 per cent of the population were landless due to an unequal distribution of land rather than to absolute pressure on land resources. When it came to land cultivated per household including sharecroppers, the team had the impression that the distribution of farm land according to who cultivated it, rather than according to owned it was considerably more equal.

Fragmentation of holdings was common in the sample, the typical farm consisting of a houselot sawah area, a dryland annual cropping area and a perennial crop area all of which may be located at some distance from one another. Table 1.16 shows the average number of fragments owned by farmers in the sample area.

Table 1.16

AVERAGE NUMBER AND SIZE OF LAND FRAGMENTS OWNED
BY SAMPLED FARMERS IN NORTH LUWU 1975

Area	Lamasi	Bone Bone	Kalaena	Total
No. of Sample	50	271	50	371
Average No. Land Fragments Owned	2.6	2.8	2.6	2.6
Average Plot Size	0.42	0.39	0.61	0.46

1.4.2.3. Cropping Patterns and Intensities

Cropping patterns are on the whole simple for both irrigated and dry land farming. Intensities vary according to irrigation conditions on sawah areas and range from moderate to high on dryland areas depending on rainfall distribution and the importance the individual attaches to annual dryland cropping. On areas where insufficient water is available or on rainfed sawahs, only one crop is normally grown in the main season followed by a fallow. Generally cultivation of the main crop begins in January in the northern part of the Kabupaten, with harvesting taking place in April. In the case of double cropping this is followed by a two month fallow period and the off season crop is planted in mid-July. In the south planting in both seasons generally take place a month earlier. In sawahs where double cropping of rice is not possible other annual crops are seldom grown in the off season although there is normally sufficient rainfall to do so.

On upland areas rice followed by fallow is one of the commoner practices, while a pattern of rice followed by maize, or maize followed by maize is also practised. Inter-cropping of rice and maize, maize and groundnuts, maize and soya bean is practised but cassava is mono cropped. Intensities for dryland annual cropping can range as high as 250 per cent according to evidence in the North Luwu Micro Economic study but this is unusual. A large variety of perennial crops including soft and hard fruits, coconuts, coffee, cloves, bamboo, are grown on dryland areas, largely in a polycultural pattern on both the houselot and separate lots. Wild sago is also cultivated in swampy areas by some farmers.

1.4.2.4. Labour Availability, Labour Utilization and Household Income

The North Luwu Micro Economic study found that the daily labour output for a farming family in the area survey was equivalent to 1.9 man days in Lamasi and Bone Bone and 2.4 man days in Kalaena. This would give a peak monthly output of 40-50 man days in Lamasi and Bone Bone and 50-60 man days in Kalaena. The actual utilization of man day output is shown in table 1.17 indicating that farmers in Lamasi and Bone Bone use only 50 to 60 per cent of their

potential labour output in the first four months of the year declining to approximately 30 per cent by the middle of the year. In the Kalaena area on the other hand labour utilization is virtually at maximum for the first four months of the year and the lowest utilization reached is approximately 40 per cent of peak output at the end of the year. All farmers in the sample spent an average of 66 work days on non-farm activities, 52 of which were spent on income earning activities and 20 on assisting their neighbours to cultivate their land or build and repair houses. They receive no payment for these gotong royong activities which are carried out on a mutual exchange basis. Hired labour is normally in the form of sharecropping and itinerant labour is available from neighbouring villages at harvest time.

Table 1.17

MONTHLY LABOUR OUTPUT NORTH LUWU SAMPLE AREA 1975
(Man Days)

Month	J	F	M	A	M	J	J	A	S	O	N	D
Area												
Lamasi	25	25	29	23	17	13	15	15	17	13	11	8
Bone Bone	19	17	21	15	15	13	13	11	10	8	10	10
Kalaena	55	50	58	53	43	38	29	26	26	24	22	24
Average												
Survey Area	23	27	21	19	17	13	15	13	11	11	10	10

An interesting follow up to off-farm employment was provided by the Impact Evaluation Study of the Luwu Area, when it was found that the provision of irrigation increased the demand for labour for the cultivation of rice and the income from the latter. Income from off-farm employment and livestock was second in importance, while income from the cultivation of other crops had become relatively less important, indicating that when the opportunity is available the farmer will deploy his labour resources in those directions which maximize his income. Table 1.18 shows the household incomes obtained from farm and non-farm sources by the farmers sampled in the North Luwu Micro Economic Study.

Table 1.18

HOUSEHOLD INCOME OF FARMERS SAMPLED IN NORTH LUWU 1975

Area	Lamasi	Bone Bone	Kalaena
No. of Farmers	50	271	50
Average Farm Income	88,202	29,903	36,237
Average Off Farm Income	21,889	27,775	22,816
Average Total income	110,091	57,678	59,053
Farm Income Per Cent of Total	80	52	61
Off Farm income Per Cent of Total	20	48	39

1.4.2.5. Capital Resources

Land is the major investment made by all farmers in the Kabupaten and according to the evidence available from the North Luwu Micro Economic Study the value of land varies considerably from area to area, according to soil fertility, distance from major population centres and population density.

The main investment in buildings was the dwelling house particularly for transmigrants, other buildings or structures which were found in varying degrees among the farmers sampled, were those for rice storage, livestock pens and padi threshing floors.

Tools were usually of a simple nature and included the hoe, an animal plough, a raker and axe and sickle but not all farmers owned a plough and raker. Weeding and lining tools were not available at the time of the survey but knapsack sprayers were available through the Bimas programme. The other major investment in equipment was in the buffaloes and cattle which were used as draught animals.

Total farm investment for the sampled farmers is shown in table 1.19.

Table 1.19

INVESTMENT VALUE OF LAND, BUILDINGS AND EQUIPMENT OF SAMPLED FARMERS NORTH LUWU

Area	Lamasi	Bone Bone	Kalaena
No. in Sample	50	271	50
Housing	67,446	52,413	28,667
Tools	4,680	3,021	5,041
Livestock ¹	27,555	20,764	32,890
Total	96,881	76,198	66,598

¹Includes all livestock not only draught animals.

1.5. Extension

Extension is provided by the line agencies of the Ministry of Agriculture. Dinas Pertanian Rakyat (Smallholder Agricultural Service) provides extension for food crops under a training and visit system. Its major responsibility is the provision of inputs under BIMAS programme for the intensification of rice cultivation. It also provides to a lesser extent, inputs and extension for other annual crops under the INMAS programme and on a small scale, extension and inputs for fruit growing.

Dinas Perkebunan Rakyat (Smallholder Estate Service) provides extension and inputs for tree crops and for field crops classified as industrial crops, such as sugar, cotton and tobacco. It also has the function of transferring research findings to the smallholder and of guiding him in

cultivation methods which do not endanger the environment, mainly by limiting planting on steep land to slopes under 15° and by encouraging the use of cover crops and terracing when planting on slopes. The most important programmes in Kabupaten Luwu in 1983 were those designed to rehabilitate smallholder coconut and coffee areas.

The main programme of Dinas Peternakan (Livestock Service) aims at bringing about an increase in cattle numbers through vaccination against major diseases and encouraging improved grazing methods. Lesser programmes are the introduction of Kaki Kambell ducks to smallholders, the improvement of indigenous poultry through vaccination programmes and the introduction of exotic breeds on a small scale. There is also a programme for cross breeding of cattle using imported semen and imported bulls. In Luwu Dinas Pertanian's operations have been limited by shortage of staff and supplies of vaccines.

Dinas Perikanan (Fisheries Service) is preparing plans at the provincial level for the development of fish farming in sawah areas and in brackish water ponds, but is hampered in implementation by lack of funds. At present its main service in the Kabupaten is the provision of fry at subsidized prices from hatcheries in Mangkutana, Bone Bone, Bajo and Walenrang, where there are three.

1.5.1. Lappo Ase Program

A major institutional innovation was the introduction of the Lappo Ase programme to the Kabupaten in 1982. This is a national programme designed to increase rice production by intensifying and coordinating existing support services. This meant ensuring that the inputs provided under the BIMAS programme were available on time at the village level, that credit could be obtained from Bank Rakyat Indonesia, that there were sufficient extension staff available in the Kecamatan to advise farmers, that educational courses were available for participating farmers, that storage was available and that assistance was available where necessary to put irrigation systems in good order.

There was no statistical evidence available in early 1983 on the response obtained but the reports from the Camat were generally favourable. Yield increases of up to 100 per cent and a 30 per cent increase in off season cropping were reported in some areas. The general consensus, however, was that the prime benefit of the programme was that it demonstrated the value of a co-ordinated effort by several agencies at the village level.

1.5.2. Rural Extension Centers

By far the most important institutional development affecting extension has been the Rural Extension Center Subproject, set up under the USAID loan agreement with the Government of Indonesia for the Luwu Area Transmigration Development Project. The programme was initiated in 1978

under the Ministry of Agriculture with the assistance of a Consultant Extension Advisor. It was designed to provide training in improved agricultural practices for those areas being settled in North Luwu under the Transmigration Sub project and for those smallholders already farming in the area. A headquarters in Palopo and four centers have been constructed in Bupon, Walenrang, Bone Bone and Mangkutana.

The main thrust of the REC programme has been to hold field training sessions at demonstration sites for both contact and other farmers, who are encouraged to implement as many of the activities demonstrated as possible, before the next visit occurs. Courses are also provided for farmers over a three day period on key subjects of major importance to them such as rice production and improved post harvest practices for rice and other field crops. The REC has also provided training on nutrition, has assisted in the vaccination programmes for livestock, introducing new feeds for poultry, plus in some cases, exotic breeds; has provided training in the proper cultivation and management of coffee and cloves; and in 1983 was in the process of setting up fisheries demonstration units.

The major importance of the REC sub project is that it has provided the beginning of a whole farm approach to extension. It has worked across the board on all activities carried out by the farmers and has shown the need for the separate line agencies to work together. In 1983 a training course in the methodology necessary to develop a whole farm approach to extension was prepared for the senior staff of the various extension agencies.

1.5.3. Farm Cooperative Centers

The other major institutional innovation in the Kabupaten was the setting up of the Farm Cooperative Center (FCC) subproject, where the aim was to establish FCCs in the Luwu Area, with financial assistance from USAID. The purpose of the sub project was to provide support to the local primary cooperatives the Koperasi Unit Desa (KUDs) or village cooperative units. The specific aims of the FCC sub project were:

- (a) to provide transmigration and local farmers in the area the support necessary to improve their farm management and business skills and,
- (b) to encourage more rapid use of improved agricultural practices and improved seed varieties.

The FCC was set up as a semi-autonomous secondary cooperative within the existing cooperative framework, designed to support the primary cooperatives, the KUDs. It was also intended that the FCC should be self-financing by generating sufficient revenue to finance operational expenses and repay capital loans.

In order to achieve their major aims it was envisaged that FCCs would:

- (1) Encourage the production of secondary high income crops by providing appropriate marketing, transport and processing facilities,
- (2) Provide farmers with credit through KUDs
- (3) Provide tractor hire services to farmers
- (4) Support livestock prices by developing appropriate marketing activities
- (5) Produce livestock feed
- (6) Form Desa level agricultural co-operatives and provide a training programme in co-operative operation and management.

The FCC programme has been remarkably successful, there are now 3 FCCs established in the North Luwu Area and a fourth has begun operation in the southern part of the Kabupaten. Crop marketing and processing operations, input supply systems, credit facilities and seed multiplication units for the provision of improved rice seed have all been established and work is continuing to get the other parts of the programme fully operational. Membership of KUDs in the Kabupaten rose from 4,122 in 1978 to 9,122 in 1982 and from 3,638 to 7,050 in the same period in North Luwu project area.

CHAPTER 2
MARKETS, MARKETING AND INPUT SUPPLIES

2.1. Markets for Crops

In general past increases in agricultural production in Luwu have taken place without reference to any very specific assessment of markets and marketing conditions. For those crops whose output has expanded the increase has been production rather than market oriented, having largely come from an expansion of area cultivated as the number of farming families increased. Even for rice where there has been a deliberate policy of stimulating production, the overriding aims have been to achieve national self-sufficiency in quantitative rather than in competitive market terms, and to provide income and employment for settlers under the transmigration programmes. These aims have been successfully achieved in Luwu aided by Government support policies, but so far no assessment has been made of Luwu's competitive position as a surplus producer of rice in relation to possible other surplus producing areas both within the Province and throughout the country.

At this stage of agricultural development in the Kabupaten, further large increases in the production of rice are possible with the planned large expansion of fully controlled irrigation in North Luwu. Furthermore if the existing pattern of mixed farming settlement is followed, the capacity to increase the production of other crops will also increase substantially. Over and above this capacity to expand cultivated area, are the various intensification programmes, which until now have not had a large impact on total agricultural production, but which will have an increasing impact in the future particularly where controlled irrigation facilities are available. It is also possible that not all of these potential production increases can be absorbed profitably by the market at any given time in the future. This does not mean that the market for agricultural produce will not expand substantially, but rather that it is now possible to increase production at an annual rate which is greater than the annual increase in market growth.

This possibility places small farmers at a risk which is beyond their capacity to undertake and no substantial increases in production should be planned until markets have been assessed so that it is reasonably clear that the increase can be absorbed by the market at a price which makes it profitable for the farmer to grow the crop. This must be a continuing analysis as production, consumption and price conditions change over time. The following is an initial attempt, based on the limited evidence available (see table 2.20) at the time of writing, to begin the identification of the trends and possible constraints in the markets, for the major crops produced in the Kabupaten.

Table 2.20

PRODUCTION AND WHOLESALE PRICES OF MAJOR AGRICULTURAL COMMODITIES IN SOUTH SULAWESI
1975 - 1980

	1975	1976	1977	1978	1979	1980	Per Cert Increase 1975 - 1980
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<u>Padi</u>							
Production 000 tons	1,770.0	1,835.0	2,012.0	2,403.0	2,395.0	2,554.0	44
Price/ton 000 Rp	-	46.3	66.5	55.4	58.8	61.9	34
<u>Maize</u>							
Production 000 tons	107.0	115.0	192.0	229.0	166.0	289.0	170
Price/ton 000 Rp	46.7	54.8	54.4	43.6	38.4	43.9	-6
<u>Cassava</u>							
Production 000 tons	230.0	209.0	240.0	283.0	252.0	262.0	14
Price/ton 000 Rp	-	-	2,989.0	3,216.0	4,316.0	3,911.0	35
<u>Soya Beans</u>							
Production 000 tons	4.0	5.0	7.0	11.0	11.0	13.0	225
Price/ton 000 Rp	122.6	107.6	157.5	168.8	174.4	149.9	22
<u>Coconuts</u>							
Production 000 tons	65.0	68.0	70.0	72.0	68.0	-	5
Price copra/ton 000 Rp	68.7	106.0	185.5	205.8	177.2	152.7	122
<u>Robusta Coffee</u>							
Production 000 tons	6.6	5.7	5.7	6.0	6.5	-	0
Price/ton 000 Rp	360.4	612.2	1,462.2	840.7	1,099.3	820.2	128
<u>Cattle</u>							
Head/slaughtered	19.4	23.6	26.0	28.5	27.2	-	40
Price/head 000 Rp	38.1	49.1	80.9	80.5	80.4	80.1	110
<u>Prawn</u>							
Production 000 tons			3.6	4.2	5.5	4.9	36
Price/ton 000 Rp ²	1,580.0	2,293.0	2,555.0	2,708.0	4,843.0	3,382.0	114
<u>Milk Fish(dan deng)</u>							
Production 000 tons			16.2	16.4	15.5	16.0	0
Price/ton 000 Rp	157.0	193.0	280.0	200.0	301.0	300.0	91

Sources: Statistical Year Book of South Sulawesi, Price Statistics South Sulawesi 1980

Note ¹All prices expressed in constant 1975 rupiahs.

²Export prices f.o.g.

2.1.1. Rice

Between 1975 and 1981 provincial production of rice expanded by an estimated 44 per cent, while prices in constant terms rose by an estimated 34 per cent, indicating a very strong and large demand for rice during that period. Prices in Luwu continued to rise in 1981 in constant terms but declined slightly in 1982, according to information available from the Statistical Office in Palopo.

Most of the past increases in rice production have been absorbed by the producers themselves while surpluses to consumption have largely been disposed of to local markets in and around the Kabupaten. The Master plan for the North Luwu Plain, however, projected that on quite realistic yield levels of 8 tons per hectare per year of double cropped rice, 800,000 tons of rice could be produced in the project area alone by the time of completion. It was also estimated that 658,000 tons of this production would be surplus to the consumption requirements of the population in the area, i.e., approximately 3 times the total estimated production in the Kabupaten in 1981.

Indonesia is now moving towards self sufficiency in rice production and if the drive throughout the country to intensify production continues to succeed, may eventually move into exportable surplus. In this case the value of additional rice production over and above domestic consumption needs would be determined in economic terms by the export value at the farmgate, which would probably lead to a change in present subsidy policies. If this possibility occurs in the future then production increases of the magnitude envisaged in the Master Plan might lead to a considerable drop in prices. In these circumstances the growing of rice for exportable surplus from Luwu might not be profitable, in economic terms at least, because of: (a) possible relatively high costs of irrigation, (b) possible relatively high costs of fertilization and (c) possible relatively high costs of transport if Ujung Pandang remains the major exit point for the Province.

It is implicitly assumed in the provisional provincial agricultural policy that the capacity of the market to absorb additional rice production from South Sulawesi may be limited. It is envisaged that major increases in production should come from the producing areas in the center of the province, while areas such as Luwu should concentrate on increasing the production of other annual crops. There is therefore a need to question how quickly rice production should be expanded in Luwu, in order that the implications of possible changes in markets for the profitability of additional production can be assessed.

2.1.2. Maize

Maize production increased rapidly within the province between 1975 and 1980, but prices after rising rapidly between 1975 and 1977 declined thereafter to below their

1975 level in constant terms. Prices in current terms were constant in Luwu throughout 1982, according to information available from the Statistical Office in Palopo, indicating a further decline in constant 1975 prices. The amount of maize exported and entering inter-island trade was relatively small in 1978 and 1980 and it would appear that most of the maize production in the province was absorbed in the domestic market. Although the market for maize should continue to grow both within and outside the province, particularly if the market for animal feed develops, present indications are that there will be year-by-year limits on the amount by which production can be increased profitably.

This may be particularly so in Luwu, in the short-term at least, since it has to compete with large production bases to the south, particularly in Bone and Soppeng, where peak areas of 99,737 hectares and 35,103 hectares respectively were cultivated in 1980. The total area of maize cultivated in the province was 351,529 hectares and since the average provincial yield was only 0.8 tons per hectare there would appear to be considerable scope for substantial increases in production through intensification. In this respect Luwu does not appear to enjoy any particular comparative advantage since on present evidence, its soils are not highly fertile. It is also probably at a comparative disadvantage with an area such as Bone in terms of competition for inter-island trade since the latter has the capacity to produce maize in bulk near the port of Ujung Pandang.

2.1.3. Cassava

Although cassava production increased rapidly in the province between 1975 and 1978 it declined between 1978 and 1980 despite a rising price trend. This probably indicates a production and possibly a marketing bottleneck. Cassava is normally cultivated in small patches around or near to the house lot and is grown particularly to ensure a basic food supply when opening up new land. Once a plentiful supply of rice is available, cultivation tends to diminish although it seldom disappears altogether. The major single market for cassava is the ECC which has just agreed to a new quota for the export of cassava from Indonesia, but a major difficulty in meeting the requirements of this market is that of collecting from small scattered production units which tends to increase marketing costs.

Luwu has one of the largest cultivated areas in province, accounting for 14 per cent of total cultivated area in 1980. It should therefore be able to take advantage of expanding export markets provided production units can be organized on a larger and more contiguous scale so that collection is easier. The main constraints to larger scale production on small individual farms is that cassava has a long maturation period compared with other annual crops and has heavy labour requirements at harvest time. Another disadvantage with small farmers is that it requires careful rotation with non-root crops and heavy fertilization if it

is to be grown continually, since it is a heavy feeder and can rapidly deplete soil nutrients if these conditions are not met.

2.1.4. Soya Beans

Production of soya beans in the province rose rapidly from a small base of 4,000 tons in 1975 to 13,000 tons by 1980. In constant 1975 terms prices rose rapidly between 1976 and 1979 and dropped substantially in 1980. The area cultivated in Luwu fell from 4,300 hectares in 1979 to 1801 hectares in 1981. Prices fell rapidly in the early part of 1983 which would suggest that demand had not significantly increased. As Indonesia was still importing substantial amounts of soya bean in 1983 this would seem to indicate a marketing limit within the Province.

Substantial amounts of soya bean are still being imported to Indonesia and the demand for soya bean should continue to grow as soya bean curd is an integral part of national diet, and Luwu should be able to expand production since its present production base is small. The general market situation does require constant monitoring, however, given present evidence of low provincial demand and because of the technical ease at least, with which production can be increased in many other parts of the country.

2.1.5. Coconuts

Prices for copra rose very rapidly between 1975 and 1978 and thereafter declined substantially between 1978 and 1980 although still remaining 122 per cent above their 1975 level in constant 1975 terms. Production responded only slightly to this price rise largely because it can only be substantially increased by new plantings or replantings which take a minimum of four years to produce.

Present policies are largely aimed at increasing production for the copra market which has to be monitored very carefully as the production of palm oil, which is a major competitor to coconut oil, is increasing rapidly in Sumatra and oil palm is also being planted in Bone Bone by PNP 28. On present estimates production of between 40 to 50,000 tons of crude palm oil will be on stream between 1990 and 1995 from this estate, and it is also intended to refine the crude oil into cooking oil.

Normally coconut oil produced from smallholder copra cannot compete with refined palm oil produced on large estates unless there is a specific preference for coconut oil among consumers. This is assumed to be the case in Indonesia and that coconut oil will continue to compete with palm oil. The latter will however inevitably compete to some extent with coconut oil on the oils market, particularly if it is mixed with coconut oil in order to give it the taste required by consumers.

The smallholder coconut rehabilitation programme in Luwu was experiencing severe marketing restraints in the early part of 1983 which were causing the price of copra to be well below that of fresh nuts and this is likely to continue while copra processing and collecting facilities are rudimentary. Large scale increases in coconut production should not therefore be encouraged unless fairly specific marketing opportunities have been identified and adequate copra processing and collection systems can be provided.

2.1.6. Coffee

Coffee would appear to suffer from similar limitations to coconut since although the price rose extremely rapidly between 1975 and 1969 production actually declined marginally according to figures available (see table 2.20). Many smallholders in the Kabupaten. Cultivate coffee in a semi-wild state, the crop often being allowed to propagate unattended, while harvesting methods are extremely primitive. Substantial increases in production can be achieved, however, by pruning and fertilization but largely because of a lack of extension this programme was not extensively applied between 1975 and 1980. Extension to rehabilitate existing coffee plantings is now being provided by Dinas Perkebunan Rakyat, but the programme is running into marketing and possibly market restraints since smallholders were not receiving a price in early 1983 which made production attractive, although better prices were being received where co-operatives were working effectively.

The immediate prospects for coffee production are not particularly favourable. Total coffee stocks in the country are estimated at 360,000 tons in 1983 of which 75,000 tons will be absorbed by the domestic market and 144,000 tons will be exported under quota agreement, leaving a surplus of 141,000 tons to be disposed of in non-quota export markets.

2.1.7. Cattle

The number of cattle slaughtered rose virtually continuously between 1975 and 1980 and according to the Provincial Office of Dinas Peternakan reached 37,783 head by 1982. The Province is a major cattle rearing area in the country and accounted for 80 per cent of the national breeding stock in 1982. The major aim of present policy is to increase the cattle population as quickly as possible in order to maintain stock, provide draught animals and supply both the increasing provincial market and the markets in East Kalimantan. The strong demand for beef is indicated by a rapid rise in prices between 1975 and 1977 which then remained constant against increasing production.

2.1.8. Prawns and Cultured Fish

Prices for prawns increased very substantially between 1978 and 1979 and although they declined in 1980 had risen rapidly again by 1983. The export market for prawns continues to grow, while production has failed to respond

significantly, largely because of limitations on the supply of fry and difficulties experienced by farmers in constructing and maintaining ponds. Marketing is handled by private traders who pack the prawns in ice for dispatch to cold storage in Ujung Pandang. There is large potential for significant increase in prawn production in the Kabupaten, particularly for export to Japan once the difficulties of supplying fry and constructing and managing ponds properly are overcome.

Cultivated fish similarly enjoyed a rapidly rising demand between 1975 and 1980 when prices in constant terms rose by 91 per cent while reported production remains static. Cultured fish cultivation suffers from similar production limitations as prawn cultivation and in addition suffers from marketing constraints at present. This is due to the fact that cultured fish is harvested twice a year and because of lack cold storage facilities has to be disposed of to largely local markets over a short period. This depresses the price to the producer beyond certain production levels and adequate storage facilities will be essential if production is to be expanded.

Despite these limitations it would appear that cultured fish production in Luwu is already responding to strong market demand. According to figures from Dinas Perikanan the area of fresh and brackish water fish ponds rose from 8,710 hectares in 1980 to 9,298 hectares in 1981 and production from 2,668 tons to 4,432 tons.

2.1.9. Cloves

Clove production is as yet small in the province amounting to 91 tons by smallholders and 28 tons by estates in 1979. Production will however rise very rapidly in the future as large areas planted in the 1970's come in to bearing. Plantings of cloves are continuing rapidly in the Kabupaten, largely on private initiative because of the very large domestic market and very high prices obtained. High rates of planting are likely to continue in the future the only constraint being the present policy to discourage planting on steep land.

The agricultural staff in Larompong feel that clove plantings may be expanding too quickly because similar rates of planting are occurring in other parts of Indonesia, raising the possibility of a glut in the future, particularly if an increasing awareness of the health hazards of smoking should lead to a decline in cigarette smoking. If this possibility did arise, growers in Larompong could be particularly disadvantaged, since many of the plantings are in remote, steep areas with very poor access.

2.2. The Marketing System

The present marketing system consists of a mixture of direct selling to local markets, selling through village co-operatives and selling to private traders. The basic collecting point is the village (Desa) market, which is

supplied by commission agents for the main traders. The trader arranges for produce in excess of local retail market requirements to be taken to the main Kabupaten market in Palopo and the other major exit points for markets outside the Kabupaten. Some traders work directly from Ujung Pandang particularly for high value produce such as cloves and prawns.

The major institutional market outlets for rice are the KUD the primary cooperatives at the village level. Table 2.21 shows the different disposal methods for rice used by farmers in the North Luwu area and in Bupon and Bajo.

Table 2.21

OUTLETS USED BY FARMERS FOR DISPOSAL OF RICE

	Co- operatives	Traders	Local Markets	Millers	Consumption/ Stock
% Disposal of crop by farmers in North Luwu	41	34	3	9	13
% Disposal of crop by farmers in Bupon-Bajo %	33	6	47	-	14

Source: Impact Evaluation of Luwu Area and Transmigration Project: University of Hasanuddin Research Team.

In general where KUD's are operational, rice marketing is working well, aided by the marketing operations of DOLOG and the Farm Cooperative Centers. In some cases where KUDs are not functioning properly, private millers buy direct from the farmers in the name of the KUD for disposal to DOLOG. This allows the millers to exert a price squeeze on the farmers but the FCCs have overcome this problem in the North Luwu area. On the whole because of high demand and good market prices purchases into DOLOG stocks have been small amounting to only 10,000 tons in 1982.

The KUDs do not purchase other annual and perennial crops to the same extent as rice and in many cases in early 1983, farmers were having difficulty in disposing of their produce profitably. This was particularly so for coffee and copra and for annual crops in the southern part of the Kabupaten. For the most part outside of North Luwu, adequate collection and storage facilities for annual and perennial crops do not exist, although there will be some improvement with the newly commenced FCC operations in South Luwu based on KUD Barona, and the farmer has little bargaining power with the traders. In North Luwu the FCC has provided rice milling units, rice godowns, rice drying floors, a harbour warehouse and a marketing center. Although the volume of non-rice grains is small, these facilities plus a system of marketing intelligence have allowed members of the FCCs to increase profitable sales of grain, which in total rose to 7,441 tons in the first three quarters of 1982/1983.

A fisheries cooperative was also set up in early 1982 to assist fish farmers to improve their production and marketing operations.

2.3. Input Supplies and Credit

Purchase of agricultural inputs are relatively small when calculated against the total area of rice cultivated. Between 1981 and 1982 the average value of inputs purchased ranged from 2,000 rupiahs per hectare to 12,200 rupiahs per hectare. Total expenditure on mechanization in the Kabupaten rose from 2.3 million rupiahs in 1975/1976 to 173.3 million rupiahs in 1980/1981 but declined to 119.3 million in 1981/1982. The main source of physical inputs is the BIMAS package for the intensification of rice cultivation, which is administered by Dinas Pertanian through the KUDs and to a much smaller extent the INMAS package for non-irrigated annual crops. Mechanization is usually acquired through purchase of the farmers own tractor, hire from another farmer or contractor or through various institutional co-operative systems.

Although the provision of inputs has greatly increased under the Lappo Ase program in certain areas, the BIMAS provisions are often less than satisfactory, largely because of inappropriate timing and insufficient delivery. The results of institutional mechanization programmes have been mixed and on the whole they have failed to operate profitably. The FCCs which began operating in the North Luwu area in 1978 have been extremely successful in the provision of inputs particularly in Wotu, Malili and Nuha, where they provided no inputs in 1980 but by 1982 were providing 100 per cent of the inputs supplied in those areas. The FCCs also have what promises to be the most promising institutional mechanization service in the Kabupaten. Certain operational problems have still to be overcome before a full viable operation can be mounted, but in 1983 ten mini tractors procured in late 1982 were able to cultivate 100 hectares without significant down time.

Credit is obtained from a wide variety of sources including family, friends and traders while the main institutional sources are the Bank Rakyat Indonesia (BRI) and the FCCs. BRI provides credit and finance for a wide variety of agricultural activities, the major one being the BIMAS package of inputs but it is also gives credit for the perennial crop rehabilitation programmes of Dinas Perkebunan Rakyat and loans are also provided for intensive livestock raising and fish farming. The main complaint against the BRI for annual crop inputs is that its procedures are cumbersome which leads to delays in receiving funds in sufficient time to purchase the inputs for planting.

The FCC has also instituted a credit programme for purchase of inputs in North Luwu under which borrowers are required to be members of a sub co-operative group. All

loans granted to members have to be approved and guaranteed by the group while the amount of loan is limited to the groups' saving with their KUD. Under this system the loan volume rose, within two seasons, from sufficient to provide inputs on 500 hectares to sufficient to provide inputs on 5,200 hectares.

CHAPTER 3
AGRICULTURAL RESEARCH

Lembaga Penelitian Pertanian Maros (The Maros Research Institute for Agriculture) began implementing a system of adaptive research in South Sulawesi in 1979, of which cropping systems research is the major component. North Luwu has been chosen as one of the areas in the Province where adaptive research into suitable cropping patterns for small farmers is being carried out.

The aims of the research in Luwu are stated as:

- (a) to increase farmers profit per unit of land by,
 - (i) developing economic and stable cropping patterns for the particular soil and climatic conditions of the area and,
 - (ii) developing a package of practices with which to manage the individual and collective crops within the cropping patterns,
- (b) to increase employment opportunities and to distribute labour utilization more uniformly in order to permit more extensive land cultivation,
- (c) to improve the farmers overall socio-economic condition by increasing the frequency of harvesting, by increasing the profit per harvested crop and by minimizing the need to borrow and,
- (d) to teach improved practices to farmers, extension workers and government officials through the demonstration of research trials.

The research is^a carried out in co-operation with selected farmers whose farming practices are typical of the farming practices in the area. All cropping pattern trials are managed by the farmer but he is assisted in his management decisions by the researcher, thus combining practical knowledge of the environment with research knowledge of improved cropping practices. All farmers participating are asked to make a daily report of all inputs and outputs in order to assess the profitability and constraints associated with the introduction of a particular cropping pattern.

An important part of the research is that a baseline survey is carried out on the farmers participating in order to:

- (a) to establish base period conditions for each site for the purpose of evaluating future change,
- (b) to describe the existing resources in terms of quality, quantity and utilization,

(c) to identify existing management practices and levels of technologies which either serve as constraints to productivity or which contribute to productivity increases and thus can be adapted in other sites,

(d) to identify existing cropping systems and constraints to higher productivity and profits associated with these systems,

(e) To assess

- (i) why farmers do what they are doing,
- (ii) farmers' opinions of their constraints,
- (iii) farmers' response to innovations,
- (iv) farmers' goals, needs and aspirations.

At present the research station is in the process of publishing the results of dry land cropping trials in the southern part of the Province at a transmigration unit in the village of Puriala. The cropping patterns chosen after the tests were completed are shown in Figure 1 and all are proven to be agriculturally viable in the climatic conditions of the region.

Table 3.22 shows the relative profitability of the four cropping patterns which has been proved under actual field conditions. Obviously at present farmers would tend to choose cropping patterns 1 and 2 which use slightly less labour and give a much higher net return under the marketing conditions prevailing in 1981/1982. These however may change over time and cropping pattern 3 and 4 become relatively more attractive.

Table 3.22

NET INCOME ACHIEVED FROM CROPPING PATTERNS TESTED AT PURIALA
TRANSMIGRATION UNIT 1981/1982

Cropping Pattern	Gross Income (Rp/ha)	Input Cost (Rp/ha)	M/Days	Cost (Rp/ha)	Net Income (Rp/ha)
1	960,500	251,440	446	267,600	441,600
2	826,500	210,740	441	264,600	351,160
3	703,500	194,940	493	295,800	112,760
4	562,500	154,940	456	272,600	243,960

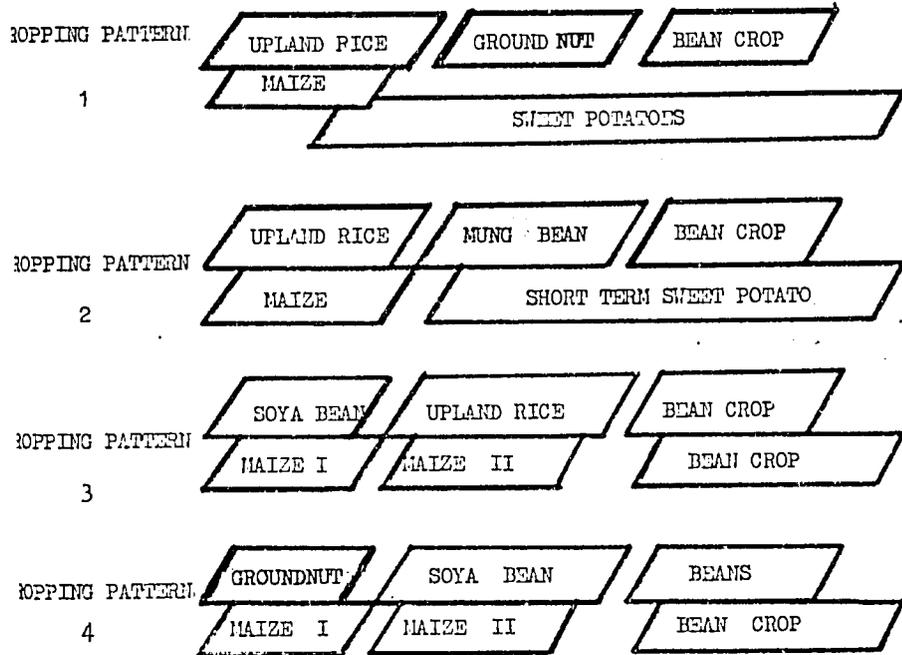
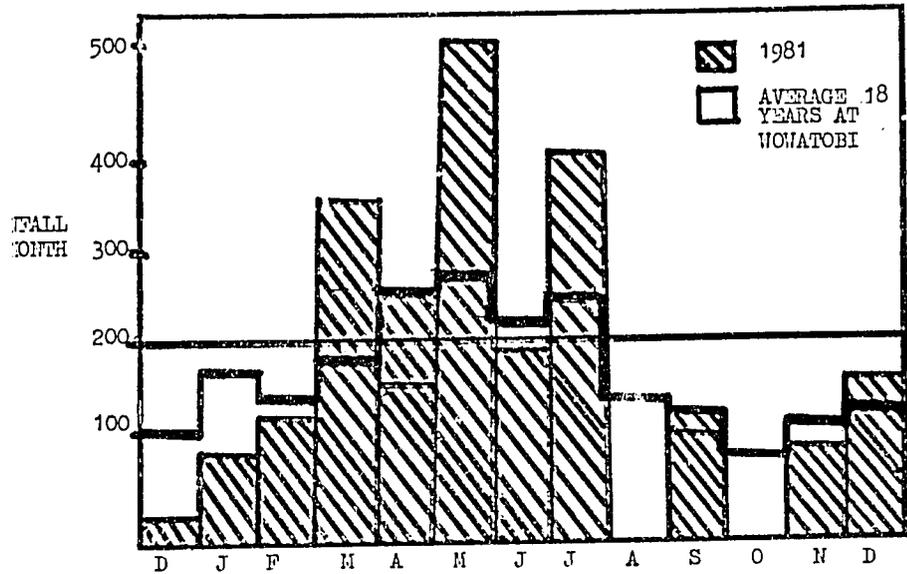
Source: Unpublished Data, Lembaga Penelitian Pertanian Maros

The analysis of data on trials carried out in North Luwu is not so far advanced but cropping patterns on three sawah areas have been evaluated which are:

- (a) Rice - rice - fallow
- (b) Rice - rice - rice
- (c) Rice - rice - catch crop

FIGURE 1

AVERAGE RAINFALL AND CROPPING PATTERNS
INTRODUCED AT PURIALA 1981-82



Source : Unpublished data Lembaga Penelitian Pertanian Maros.

These have been largely variety trials on irrigated land with the aim of choosing a stable cropping pattern which will maximize return to the farmers' labour inputs and land.

On upland areas the cropping patterns which have been evaluated so far are

(a) rice intercropped with maize - cowpea intercropped with maize - groundnuts intercropped with maize

(b) rice intercropped with maize - cassava intercropped with groundnuts - soya bean

(c) Rice intercropped with maize - soya bean intercropped with maize - farmers choice of crop.

Rice - rice and rice - horticultural crop rotations are also being tested on sawah areas where drainage is poor and the results so far have been reported as promising.

CHAPTER 4 DEVELOPMENT RECOMMENDATIONS

4.1. General

The major strategy for the development of the agricultural economy in Luwu has been the encouragement given to the natural expansion of rice cultivation, through the national price and logistical marketing support programme. Increasingly from the mid seventies, national policy has also aimed at intensification of cultivation by providing a subsidised package of inputs designed to increase yields under the BIMAS programme. The programme was given additional emphasis in 1982 with the introduction to Luwu of the Lappo Ase programme which aimed at a further concentration of the effort to intensify rice cultivation.

The decision to settle 10,000 farming families under the North Luwu Transmigration Project beginning in 1971, and the decision in 1976, to provide controlled irrigation for existing farmers and transmigrants, in the North Luwu Plain and on new land up to 100,000 hectares, greatly increased the possibilities for the extension and intensification of rice cultivation. In addition the possibilities of intensification were further enhanced with the implementation of the FCC sub project, which was primarily designed to assist farmers increase their rice production by providing efficient milling, marketing and input supply services; and with the implementation of the REC subproject which aimed at improving rice production techniques through training of both farmers and Dinas Pertanian staff in improved technologies.

Through all of these facilities Luwu has been able, not only to meet the rice consumption needs of an increasing farming population, but also produce substantial saleable surpluses. Support for the production of other food crops on the other hand has been given very much less emphasis, and it was only in 1978/1979 when the RECs, FCCs and the Agricultural Research Institute at Maros began working in North Luwu that a significant and co-ordinated effort to increase the production of other food crops commenced.

Among the major dryland food crops which are usually produced as a marketable surpluses only maize has shown any significant and continuous increase in the area cultivated between 1975 and 1981. Area, cultivation and production of fruit and vegetables also apparently increased substantially, but whether the increase was largely due to transmigrants providing their own consumption needs, or was in fact produced as a saleable surplus is unclear.

The perennial crop sector too has had very much less support than the rice sector and, although the area cropped has expanded, how far this has been influenced by commercial marketing considerations is uncertain except in the case of cloves.

Livestock numbers have increased substantially as new farming areas have been opened up and this increase has been largely spontaneous since livestock extension and other support services have been extremely inadequate in the past. Cattle and buffalo are still regarded primarily as capital assets or kept as draught animals, but as increases in slaughtering and increases in the pig and poultry populations show, production is also responsive to expanding markets.

Fish farming has also received little support in the past and this lack is only slowly being rectified now. The result has been that production has not been very responsive to very strong demand, particularly in the case of prawns, and farmers will require considerable technical support and marketing services to be provided, if they are to take advantage of an expanding market.

Diversification in the sense of introducing new crops to the area, has been limited to cloves in the private sector and to the introduction on a small scale, of such crops as candlenut, nutmeg, cocoa, pepper and tobacco by Dinas Perkebunan Rakyat. In the large estate sector oil palm cultivation is being introduced by PNP 28. On present market indications this is the likely limit for new crops which can be introduced, while crops such as sugar, tobacco for export and cotton are ruled out on climatic considerations. Rubber is a possibility but probably could only be grown profitably on large estates. If introduced to small farmers as a new crop, the small initial production would limit opportunities for exporting profitably which would require the production of bulk quantity for shipping to Singapore or direct to markets in Japan or America. Sago flour is at present processed from wild palm which possibly could be converted to a condition of sustained cultivation, but this would require study to determine if this is technically feasible and to suggest what arrangements could be made for bulk shipment of the flour to major markets overseas.

4.2. Future Development Strategies

The agricultural development strategy being pursued at present is essentially one of attempting to accelerate the natural increases in production which are occurring as the farming population increases. This had been highly successful in the case of rice but much less so with other crops and enterprises. There is now a need to redress the balance in favour of other crops, but in view of possible market constraints, which may limit the amount by which annual production of all crops can be profitably increased, the emphasis of future development strategy should be less on maximizing and more on optimizing production in the light of future market developments. Since however, the course of markets cannot be predicted with certainty, the major aim of development strategy should be to develop as much flexibility in farming systems as possible in order that output can be optimized in relation to changing market and production conditions.

4.3. Proposed Institutional Development

The system of mixed farming developed by the farmers themselves is flexible one which can be made potentially much more profitable than it is at present. In order to fully develop this potential, however, a whole farm approach, which considers all the factors affecting farm profitability must be developed. At present this is not being attempted, except in the work of the Maros Institute for Agricultural Research. The current extension approach is limited to each agency promoting measures to increase the productivity of the individual crops and enterprises for which they are responsible, without particularly considering either the impact the development of one crop or enterprise has on that of another, or the implication for the total profitability and management of a mixed farm.

At present it is beyond the capability of the present institutional set-up to develop and implement a programme of integrated farm development. If a strategy which increases the flexibility and profitability of a mixed farming system is to be developed, then a detailed knowledge must be built up of:

- (a) the market prospects for the agricultural products of the Kabupaten,
- (b) the actual farming conditions in the Kabupaten,
- (c) the constraints which limit the opportunities for increasing farm productivity

This knowledge must then be analyzed and transformed into a coherent and implementable programme of integrated farm development. In order to develop such an approach a new type of institution is required which takes into account the policies and programmes of agricultural agencies, but prepares a programme of agricultural development which is based on an independent and comprehensive analysis of what is required in the sector.

It is necessary in the interest of sound future development in the agricultural sector to provide such an institution in Luwu and the major and most important recommendation of this report is that an Agricultural Planning Unit (APU) should be formed there, as quickly as possible.

4.4. Functions of the APU

4.4.1. Market Assessment

The first and foremost task of agricultural planning is to assess the direction and extent of markets for the crops which can be grown. Without a knowledge of market potential any decision to increase production is a purely speculative. Although an analysis of future markets cannot entirely eliminate the speculative element in agricultural marketing,

it can give a more precise definition to the risks and opportunities involved in planting various crops, and point to steps which can be taken to shield small farmers from the effects of substantial swings in market prices, such as restrictions on area cropped, the provision of storage or the creation of a price support system.

The need for a continuous assessment of markets and marketing conditions is underlined by the production and value of food crops alone, in the Kabupaten in 1981. In that year 259,000 tons of food crops to an estimated value of 14,300 million rupiahs were produced. That is a large production and marketing exercise by any standards and considerable skill and knowledge will be required to guide and market profitably further production increases from this base. One of the primary functions of the Agricultural Planning Unit would be to set up an orderly and continuous process for assessing the potential growth and future direction of the markets for the agricultural produce of the Kabupaten. In order to set up the process it will be necessary to begin developing continuous and up to date records of:

- (a) production and consumption of produce within the Kabupaten
- (b) production and consumption of produce within the province,
- (c) the direction of national production and consumption,
- (d) inter-island movements of agricultural produce
- (e) national exports and imports of agricultural produce
- (f) national policy decisions affecting production, consumption, export, import and processing of agricultural produce.

By collecting and analyzing the above data on a timely basis much clearer definition of the potential market for the agricultural produce of the Kabupaten, can be obtained. Although such an analysis cannot predict future markets with absolute certainty, it will have the prime purpose of identifying more clearly what the major market opportunities are and where there are dangers of surpluses arising. It can also identify specific market opportunities as they occur such as new processing outlets and specific export contracts which might be of benefit to the Kabupaten producers.

The other major task which has to be performed in order to complete the analysis of markets for produce from Iuwu is a continuous assessment of the competitive prices which can be obtained for it, along with an identification of any impediments which are causing the farmer to receive less than the competitive price. In order to make this assessment, an up-to-date record will have to be kept of:

- (i) retail, wholesale and producer prices in the Kabupaten,
- (ii) retail, wholesale and producer prices in the Province,
- (iii) national wholesale prices,
- (iv) international prices of exports and imports,
- (v) storage costs,
- (vi) transport and handling costs,
- (vii) port charges and shipping costs,
- (viii) taxes, duties and subsidies.

A continuous review and analysis of the above information will indicate competitive price levels at the farm gate and will also identify inefficiencies and monopolistic practices in the marketing chain.

The function of the marketing section of the APU is therefore, as defined above, primarily that of gathering and analyzing market intelligence data. If the function is to be carried out successfully links must be forged with the main kabupaten, provincial and national agencies collecting statistical data on prices and marketing. Timeliness of data is essential and in order to achieve this data may have to be gathered in unpublished form. Close links will also have to be developed and maintained with the marketing network and in particular with the FCC which operates its own system of marketing intelligence for its members.

It will take time for a fully operational system of market intelligence to be built up since establishing data sources, collecting, analyzing and presenting data is a lengthy task. Once a system of analysis and presentation has been built up then the process of identification on market opportunities and constraints becomes much quicker and easier.

4.4.2. Production Planning

The aim of achieving an increase in the total productivity and production of many farmers, who for the most part cultivate small, scattered lots and who have a minimum investment in tools and equipment, is not an easy task. Neither farmers nor farming areas are completely homogenous in these characteristics and for this reason extension, which supplies a general message to all farmers through a line commodity approach, will always be less successful than it might be. A recognition of this limitation is implicit in the work of the Maros Institute for Agricultural Research, which assesses the background of both the farmer and the farming area and enters into intensive trials with the farmers before recommending a cropping package to them. The present approaches of the REC

subproject are also moving towards overcoming the present deficiencies of extension, which is based on the promotion of the crop rather than on an analysis of what is most appropriate to the particular farming systems being considered.

If a production programme which is planned in relation to market potential is to be brought about then it is essential that the APU expands and develops the present approaches being taken by the Institute at Maros and being initiated by the REC sub project. This is necessary in order to build up a detailed knowledge of production potentials, of the constraints which limit these potentials and of what must be done to overcome constraints.

Before the APU can undertake the major tasks it will be necessary, because of the present lack of comprehensive land use data, to initially classify, by means of survey, the different farming systems found in the Kabupaten. From present limited knowledge these can very broadly be defined as:

- (a) systems where double cropping of rice predominates,
- (b) systems which are a mixture of sawah cropping and dry land cropping,
- (c) systems where dry land cropping predominates,

This is only a very broad classification based on present available data and once more detailed information is available, other systems and sub systems will probably be identified. It may also be possible to classify areas according to the farming system which predominates such as rice double cropping in the north Luwu project, mixed sawah and dryland cropping in the other northern kecamatan, and predominately dryland cropping in the southern kecamatan.

Once the Kabupaten has been classified according to the predominant farming types further surveys would have to be initiated in pilot areas within each classified type to determine:

- (i) the amount of productive land available,
- (ii) the cropping potential in terms of soils and climate,
- (iii) the balance of present cropping systems
- (iv) the quantity and quality of labour, tools and fixed investments available to the farmer
- (v) the constraints to higher productivity
- (vi) the farmers' attitude to higher productivity,
- (vii) the input supply position,
- (viii) the marketing situation.

Once these assessments have been made they will then have to be combined into a general assessment of the most suitable form of development for specific areas. These will vary according to the circumstances encountered. In some instances it will be necessary to undertake further adaptive research, in others all that will be necessary is a co-ordinated programme of extension, input supplies and marketing services, while in others a more radical restructuring of production conditions may be necessary; such as the provision of irrigation, drainage, levelling, etc., or the replanting of a perennial crop.

4.4.3. Preparation and Co-ordination of Development Programmes

It is not envisaged that the APU will prepare a development programme for the whole Kabupaten at once. Rather priorities should be established in the light of marketing and production conditions and co-ordinated implementation begin in pilot areas which can be expanded as experience is built up. It is also envisaged that the APU will have to play an advisory management role in both identification and implementation since it will have to seek the advice and co-operation of appropriate agencies for the former activity and persuade them of the need to carry out priority tasks for the latter.

It will be particularly necessary for the APU to co-ordinate its activities with the Institute at Maros, the FCCs and the RECs at the identification and planning stages; and with the FCCs, RECs and extension services at the implementation stages. Planning is thus not seen as a remote process which prepares a final blueprint which is then handed over for implementation, but as a continuous and evolving process of identification, preparation of programmes and initiation and follow through of implementation.

4.5. Institutional Position of APU

Brief discussions have been held at the Provincial and Kabupaten level on where the APU should be placed institutionally. This is a complicated issue which will require careful consideration before a final decision is made. The following suggestions are not put forward as a final recommendation on where the APU should be placed, but rather to clarify the principles under which the APU should operate.

It has been suggested that the APU should be placed in the Bupati's office since this would give the local administration a stronger voice in the development of agriculture in the Kabupaten. It would also link it with BAPPEDA which has overall responsibility for planning in the Kabupaten. The main objections to this are:

(a) the APU in setting agricultural development priorities has to be aware and responsive to wider issues than the political and administrative concerns of the Kabupaten; there is a danger that if the APU is placed in the Bupati's office it will be swamped by these concerns and become unable to present an independent view;

(b) BAPPEDA is of necessity a more remote planning mechanism, designed to assist policy making in all sectors and particularly to establish the proper development balance between sectors; as such it should be a major external influence on the APU but not to the extent that BAPPEDA overshadows its role of determining operational strategies and priorities in the agricultural sector.

The APU has to be responsive to a wide number of influences but it must both be,

- (i) independent of these influences and,
- (ii) in its turn be able to exert its own influences over a wide area in order to promote sound agricultural development.

It cannot therefore be placed under the influence of any one department if it is to be effective, and should as far as possible be an independent unit with freedom to act in what it sees as the best interests of agricultural development. If these considerations are taken into account the second suggestion discussed, that the APU be set up as independent unit under the Kanwill Pertanian, seems more appropriate. This organization is responsible for the planning and co-ordination of agriculture at the provincial level, and by placing the APU under it, the latter would be fully responsive to national, provincial and local influences, but at the same time be completely independent of any one agricultural department or administrative agency.

4.6. Role of RECs

If the Agricultural Planning Unit is to function properly it must develop a direct link with the field, so that it can mount surveys, maintain contact with key groups of farmers and promote a co-ordinated effort by the various extension and farm support services. The RECs which are primarily designed to develop a system of co-ordinated extension training are beginning to develop as important contact and co-ordination centres in the field. As such they would be of major importance to the work of the Agricultural Planning Unit and their future development should continue in these directions.

The three RECs at present functioning in Luwu come under the administration of the Agricultural Agency for Education, Extension and Training. A further 4 RECs have been set up under the control of the Office of Food Crops, and are working independently of the REC sub project. Such duplication is not in the interest of co-ordinated agricultural development and perpetuates the promotion of individual crops through extension rather than development a whole farm approach. A major impact can only be achieved by RECs if they are focal points for extension where the farmer can obtain a wide range of advice, based on a complete knowledge of his farming circumstances. Future development of RECs should therefore aim at avoiding duplication and at bringing all agricultural services together at one focal point in the field.

A future condition for the success of the RECs is that they remain independent of line agencies and that training programmes are based on judgements of actual field conditions. This is made possible at the moment by senior supervision being provided under USAID technical assistance. Without senior supervision the activities of the RECs will tend to be dominated by the headquarters policy of the strongest extension agency, and it is essential that strong senior technical supervision continues after the extension adviser has left.

Staffing in the field has been less than satisfactory under the REC sub project since staff are continually being shifted which makes it difficult to form permanent links with farmers in the catchment areas served by each individual REC. If possible at least one senior field extension officer should be stationed permanently at each REC and he should be given sufficient junior staff in order to provide continuity in operations. If the centres are to function properly staff must be given the chance to develop a thorough knowledge of the area and the farmers who work in it.

The need for an immediate expansion of RECs is not thought necessary at the moment and effort should be directed to consolidating and improving existing operations. The RECs in order to initiate training operations in the field have had to take on supply functions particularly in the area of livestock training. This should not be regarded as part of their function in the long term which is that of assisting to identify farmer problems, assisting to develop priorities for overcoming them and providing the training and support necessary for effective implementation.

4.7. Role of FCCs

The FCCs will also have a major role to play in assisting the APU to identify marketing constraints, suggesting how these can be overcome and undertaking to provide improved processing, storage, handling and marketing facilities. The FCC sub project, although still relatively small in its marketing and supply operations, is rapidly consolidating its position in this field and is now providing very effective services to its members. The continuing availability of these skills from an institutional organization will be an invaluable aid to agricultural planning and implementation.

At present no large expansion of FCCs beyond the present four in operation is contemplated. Existing facilities for processing and storage will have to be expanded in North Luwu while the facilities for the newly created FCC in the south of the Kabupaten will have to be developed to serve mainly perennial crop farmers. Increased marketing depot facilities will also be required in Palopo and Bone.

As with the RECs a high level management input, under technical assistance, has been a major condition of the success of the FCCs. This management input is going to continue under technical assistance for a further two years and it is essential that this momentum is maintained in order that strong centralized management continues to develop and becomes a permanent feature of the FCCs in the longer term. The FCC sub project has also been able to train and maintain good middle level management at the field level and it is important that this policy also continues in order to promote further successful expansion.

In addition to its major role of providing marketing and input supply services it is recommended that the FCC is used as the main means for promoting intensive livestock raising and the introduction of mechanization. It is the view of the Provincial Department of Livestock that intensive livestock raising should not be promoted unless a clearly established market outlet is available. At present farmers can obtain loans from BRI to undertake intensive pig rearing and exotic breeds of poultry plus feed packs are being distributed to individual farmers under a BRI package programme. For such enterprises to succeed, however, a high level of technical skills is required for proper construction of pens and sheds; good management is necessary to balance feed levels against live weight gain and to keep the livestock free from disease; and good butchering, weighing and marketing facilities have to be provided in order to dispose of the carcasses profitably. For the most part none of these conditions pertain in the Kabupaten and the only institution capable of providing and developing them at the farm level is the FCC. The latter has been carrying out some initial development work with poultry and has been grinding maize for animal feed. It has also been exploring the market for poultry for the workers and staff of the INCO mine at Soroako.

Mechanization schemes introduced into the Kabupaten have had mixed results. In order to maintain a fleet of tractors in constant running order considerable overhead cost has to be incurred, in the form of servicing and repair facilities by well trained mechanics and of maintaining a substantial supply of spare parts. In order to pay for this overhead a maximum deployment of machines has to be achieved, which is inherently difficult where areas to be cultivated are either small individually banded sawah lots, or even smaller scattered dry land lots.

The present approach taken by the FCC is to slowly build up the necessary servicing facilities with a small fleet of mini-tractors. Deployment is only undertaken after a careful survey of the areas requiring mechanization has been completed and an agreement has been reached with the farmers on the logistics and timing of deployment. The FCC is now able to cultivate large areas without experiencing substantial down time and it is recommended that any future increase in the provision of mechanization services is undertaken by the FCC.

4.8. Conclusions

It is realized that a new approach is being recommended to planning since the latter does not normally undertake a role in the management and direction of development, but usually remains as an analytical and advisory function. The solution put forward in this report has however taken into account present thinking at the Kabupaten and Provincial levels, where the need to plan agricultural development is recognized, although this tends to be conceived of as the production of a static plan, and where the lack of co-ordination amongst various agencies is seen as a major hindrance to faster development.

The premises underlying the recommendation put forward in this report that an APU can provide an appropriate solution to the problems of planning and co-ordination of implementation in the agricultural sector are:

- (a) effective planning of implementation cannot take place until;
 - (i) a detailed knowledge of what is happening at the farm level is available,
 - (ii) a clear assessment of market potential is available;
- (b) implementation cannot be based on a fixed long term programme since market and production conditions change and planning of implementation must be a continuous and evolving process,
- (c) in this process it is necessary to view the activities of line agencies as components in a whole and not independent development processes in themselves.
- (d) in order to develop this overall view of what is happening in the sector, and to decide on the basis of this view what development priorities are, a professionally staffed organization, which is independent of line agencies and has sufficient influence to direct their activities to priority tasks, must be formed.

Present thinking on the problems of co-ordination tends towards the re-ordering of present institutional arrangements with the formation of a committee to give overall guidance and indicate priority tasks. This system has worked to a certain degree in Project Luwu, but it is less than efficient and is not particularly capable of identifying change nor the need for it. This is largely because it does not have at its disposal the means for identifying and analyzing what is happening in the farming sector in sufficient depth. Even if it had this capacity it is difficult for a committee on which sectorial interests are represented to take an unbiased view of development priorities.

If these arguments are accepted then the need for an Agricultural Planning Unit becomes clearer, since they suggest that agricultural development in the smallholder sector is a complicated process of identifying development possibilities and constraints, establishing priorities and guiding implementing agencies to meet those priorities. In order to deal with the complexity of the development process, new institutional mechanisms, which can be involved in all aspects of development, have to be created.

CHAPTER 5
RECOMMENDED STUDIES AND
EXPERTISE REQUIRED

5.1. Study of Sawah Lands

It would greatly assist planning of agricultural development in the future if the agricultural potential of the sawah areas were evaluated in detail. According to information from the Department of Public Works a large number of existing irrigation schemes are either not working or not working well, which limits the opportunities for double cropping rice and means that large areas of land are being underutilized. It would appear technically possible to cultivate these areas with other annual crops in the dry season either with no irrigation or with a minimum of irrigation. Why sawah areas without dry season irrigation are not cropped using rainfall is not entirely clear, but it is possibly either a cultural phenomenon or is due to the fact that lands which are used for sawah are more difficult to cultivate and less fertile under non irrigated conditions than the dry land which is normally cropped. One Desa in Larompong, however, does successfully cultivate annual crops on sawah land in the dry season, according to reports of the agricultural staff there.

Prima facie there would appear to be considerable advantages in cultivating these areas in the dry season since it would centralize cultivation to a greater degree for the farmer; would increase the effective land base, which is an important need where annual land is short, particularly in the southern part of the Kabupaten; and would discourage the annual cultivation of steep land which would be better left uncultivated.

It is therefore suggested that a study should be undertaken of all sawah areas in the Kabupaten to determine what the potential for mixed cropping is both with and without dry season irrigation. The results of this study would provide;

- (a) an indication of the potential for increasing the effective land base particularly in areas where land is short,
- (b) a measure of the possibilities for changing cropping patterns on irrigated areas should double cropping of rice become less profitable,
- (c) a measure of the rate at which rice cultivation should be expanded in relation to future markets should the possibilities for mixed cropping be limited,
- (d) a measure of what should be done to rehabilitate existing irrigation areas,
- (e) a base for evaluating the design of future irrigation development in North Luwu.

In view of possible changes in rice markets it is particularly important that the assumption that irrigation development in North Luwu will continue to be based on double cropped rice, is examined in some detail. If rice cropping becomes less profitable, either alternative cropping may have to be developed, or if that is not possible, the rate at which double cropping is expanded carefully controlled. This raises quite a severe planning problem, since if irrigation systems are designed for double cropping of rice and alternative cropping systems which require less water have to be introduced, the system will be overdesigned in terms of potential water delivery. On the other hand future design cannot be based on the assumption that mixed cropping will be the general future pattern, since if future market conditions make rice cropping the most profitable form of cultivation, the irrigation system may be underdesigned.

It is thus necessary to maintain an attitude of flexibility toward the future development of irrigation in North Luwu, and each additional phase of development should be examined in the light of the potential market conditions for crops, and the potential production conditions in other parts of the Kabupaten, before a commitment is made to implement a specific form of irrigation development.

Although the Master Plan stated that the North Luwu Plain was not particularly suited for growing of crops other than rice, many areas awaiting irrigation from the first phase of development are at present quite intensively cultivated with such crops as maize and soya bean, which indicates that there is a potential for other forms of cropping. A study which evaluated this potential would therefore provide very useful base line data on which to plan future development.

An important part of this study would be an examination of the possibility of introducing more commercially viable farming systems in areas of new development. Although productivity on existing farms can be substantially increased, the potential for doing so is limited by the small size of individually banded lots under irrigation and the generally scattered nature of the lots of which other cultivation takes place. The study should therefore examine the possibilities of introducing a system where larger unit area cultivation is possible. Under such a system the farmer would still own his own piece of land but would agree to it being cultivated as part of a larger unit area on some form of a co-operative basis. If this can be achieved much more efficient use of water is possible, the problems of water control are greatly simplified and the possibilities for introducing mechanization are very much greater.

Although this is contrary to existing practices and would be difficult to introduce on existing farming systems, it should be considered as a possible innovation in the future. Economic development is bringing about change in the Kabupaten; incomes and expectations are rising, children

are being educated in increasing numbers which reduces the amount of labour in the family labour force, and employment opportunities which may appear more attractive than small farming are being created. If these trends continue it may be difficult to keep a healthy proportion of young and innovative people in the farming population. In order to be prepared for this phenomenon should it arise, as it has in other parts of South East Asia, the technical possibilities at least for introducing more commercially viable farming systems, should be known and if possible experimented with.

Studies of this nature should however only be regarded as an interim measure to be taken until comprehensive land use and land capability studies are available. These are absolutely essential in the longer term if sound agricultural planning is to take place in the Kabupaten. Until such a study is completed the exact amount of land available for agricultural development and the different uses to which it might be put cannot be determined. It is also needed to determine the present damage which has occurred in the watersheds due to uncontrolled expansion of farming land, and to assist forest management policy in deciding which areas should be left as permanent forest and which areas can be safely exploited.

Such a study will take time to mount and will be expensive and is probably a matter for provincial or even national decision makers. It is however urgent that it should be carried out as very little is known in detail of what is happening to agriculture in the Kabupaten and whether present cropping systems are actually based on best land use. Uncontrolled opening up of land is still occurring, particularly in Malili, and will continue to do so as population increases. If this natural expansion is to be guided in the right directions then it is essential that detailed land use data is available.

5.2. Fisheries

If the production of cultured fish, particularly prawn, is to be expanded rapidly to meet current and an anticipated rapidly growing demand there is a need for a considerable injection of technical advice and training into the development of hatcheries, the construction and maintenance of ponds, the provision of extension particularly for intensive raising of prawns and the creation of an appropriate marketing system. As the FCC and REC sub projects are both working on these problems now it is suggested that the additional expertise required should be channelled through these organizations. The following technical expertise will be required.

- (a) a hatchery and inland fisheries specialist for 6 months ,
- (b) a marketing specialist for 6 months,

(c) a hatcheries operation and maintenance specialist for 6 months,

(d) a fisheries extension specialist for 6 months

Their functions would be as follows:

(i) Hatcheries Specialist

-taking into account existing developments to determine the most suitable habitat for developing a commercially viable hatchery,

-determine the most appropriate methods and facilities for spawning, rearing and adapting fry and fingerlings

-determine most appropriate methods for collecting and distributing fry of fingerlings to the farmer,

-design on the basis of these findings a plant of appropriate size in relation to future market and production potentials, estimate staff required and prepare cost estimates.

(ii) Marketing Specialist

-examine the potential domestic and export markets for prawns and other cultured fish,

-examine present marketing system with a view to determining what improvements have to be made,

-recommend the appropriate handling, processing and marketing facilities which should be developed,

-prepare design, staffing and cost estimates, for recommended processing, handling facilities etc.

(iii) Operation and Maintenance Specialist

-to recruit and train staff in the operation and maintenance of a modern commercially run hatchery.

(iv) Fisheries Extension Specialist

-examine present methods of constructing and maintaining ponds and make recommendations as to how these can be improved,

-draw up an extension programme for seeding , maintenance of correct Ph, temperature, salinity and oxygen levels,

-identify major mortality risks and recommend appropriate steps to be taken to reduce them,

-examine existing extension structure and make recommendations on staffing levels, training requirements and future staffing structure,

-make recommendations on most appropriate system of input supply

-provide training to key farmers and extension staff through R&Cs.

5.3. Staffing of APU

The APU should not develop into a major bureaucratic organization but should remain a highly professional and flexible unit which is not encumbered with heavy administrative duties. For this reason the following recommendations are for key senior professional staff only and it should be left to them to build up the appropriate junior staffing levels.

Initially there is likely to be a heavy demand for survey and statistical staff in order to build up the necessary data base. These should not be regarded as permanent however and if possible the APU should co-opt the assistance of the Institute Pertanian Bogor, the Institute for Agricultural Research at Maros, the University Hasanuddin, Ujung Pandang, or commercial consultants if necessary. The APUs should be allowed an appropriate budget to employ these services as and when the need for surveys, specialist studies, etc. have been clearly defined.

In some instances it may be possible to use agricultural field staff for limited survey work at specific times and for specific purposes. As a general rule, however, extension staff should not become heavily involved in continuous survey work except where it has specific relevance to their task, such as initiating them to the approaches which are necessary to develop a whole farm extension approach.

The final full time staffing of the unit should thus be left open until the director and his professional staff have a firm appreciation of the tasks they have to undertake and what their role will be in relation to the other Agricultural institutions in the Kabupaten. The key professional staff required are:

(a) Director of Unit

For this post a senior agriculturalist should be sought with as wide an experience as possible in the problems of developing small farms. He should also have wide experience in the problems of assembling, interpreting and developing land use data and of the factors affecting small farm development such as extension, technology, marketing and input supplies.

(b) Agriculturalist

The primary responsibility of this post would be the direction of field operations and the most suitable candidate would have substantial experience of small farm

planning and of providing extension services. He should be able to work out appropriate cropping and technology systems for small farms and be able to guide adaptive research in the directions which are appropriate to existing farming conditions.

(c) Marketing Economist

The candidate for this post should have experience and ability to identify and abstract data from a wide range of sources covering the various aspects of agricultural markets and marketing systems. He should be able to develop a system of providing marketing data on a timely basis, from provincial, national and international sources of information on trade in agricultural products, prices at the various marketing levels, the systems of agricultural marketing available and the cost of handling, transporting and shipping, etc.

(d) Agricultural Economist

This candidate should also have a knowledge of small farming systems and be able to prepare farm budgets for existing systems. He should also be able to prepare proforma budgets for new systems illustrating the effect in terms of returns to land, labour and capital. He should also be able to prepare financial and economic evaluations of development projects.

(e) Statistician

This candidate should be experienced in the assembly and collation of data from a wide range of sources and be able to present statistical data in a timely, relevant and easily assimilable fashion. He should also be able to assist in setting up farm surveys by developing simple enumeration methods and standard questionnaires which will produce statistically valid data. It will be most important that he develop systems which avoid the problems of data processing blockages, so that information which is relevant to farm management problems can be produced on a timely basis.