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The Cassava Industry in Bukidnon Province

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An earlier article studied the sugar industry in Bukidnon province.¹ The present article is a similar study of the cassava industry centered in western Bukidnon. Like the sugar industry, this economic enterprise consists of three components: the mill, the planters, and labor. The majority of the planters however operate only small farms, so the distinction between owners and laboring men tends to collapse into one category since so many owners and tenants supply their own farm labor. The cassava starch factory of the Philippine-Agro-Industrial Corporation is located not far from the Cagayan River in Maasin Sitio of Barrio Nicdao, Baungon Municipality, Bukidnon Province.

Other barangays known to be engaged to some extent at least in supplying cassava tubers to Phil-Agro are Danatag, Lingating, Patpat, Imbatug (Baungon Municipal Poblacion), and Salimbalan in Baungon Municipality; Libona Poblacion, Kinawe, and Kiliog in Libona Municipality; Dagumba-an, Lingion and Talakag Poblacion in Talakag Municipality; Sto. Niño in Manolo Fortich; Bayanga, Dansolihon, Indahag, Lumbia and Mambuaya Barrios in Cagayan de Oro City, Kalabaylabay Barrio of El Salvador; Hiniplanan and Plaridel of Claveria; Sta. Ana of Tagoloan Municipality; and some barrios of the following Misamis Oriental municipalities: El Salvador, Laguindingan, Opol, and Villanueva. A radius of approximately 50 kilometers (by road) is estimated to be the economical distance.

The Philippine Agro-Industrial Corporation (hereafter called

1. Francis C. Madigan, S.J. and Isaias Sealza, "A Study of the Sugar Industry in Bukidnon Province," *Philippine Studies* 33 (1985): 459-84.

Phil-Agro) was licensed in 1977 under R.A. 6135 as a nonpioneer producer-exporter of glucose. Its Maasin factory began producing starch from cassava tubers in the second part of 1978. The plant has a rated capacity for handling 200 tons of cassava tubers per day, although in fact it had actually milled a maximum of 150 tons per day up to the time of this study.

The area dedicated to cassava production for the mill in 1978 was approximately 1,000 hectares. Only 800 of these hectares however are believed to have effectively produced cassava tubers. By 1981, cassava was grown on approximately 2,500 hectares. In 1982, an estimated 3,500 hectares were dedicated to cassava (although again tubers were not actually produced upon all of this area). Volume of cassava production for sale to the mill has increased proportionally. Estimates of the mill (interviews with officials, October-November 1982) in millions of kilograms of tubers processed at the factory were:

| 1980 | 1981 | 1982 | 1983 |
|------|------|------|------------------|
| 6.0 | 24.0 | 40.0 | 45.0 (projected) |

These data show that estimated production of tubers has increased more rapidly than estimated hectares planted to cassava. This will be seen more easily if the 1978-80 datum is taken as base (=100). In this case, production increase had nearly doubled the increase in area planted.

| | 1978 | 1980 | 1981 | 1982 |
|------------|------|------|------|------|
| Hectares | 100 | — | 250 | 350 |
| Production | — | 100 | 400 | 667 |

Possibly this means only that cassava had been grown more intensively on farms in 1982 than in 1980 when more corn and rice were perhaps also grown.

Cassava planters have thus far not organized themselves into an association like that of the sugar planters. Thus it is difficult to estimate the number of cassava planters. The nonseasonal nature of the crop adds to this difficulty. Probably the best estimate is based upon 1982 mill data. This estimated that approximately 2,000 farms were producing tubers for processing at the Maasin plant, but set a wide error range about this estimate, plus or minus 500 or more. The best estimate therefore appears to be that cassava is produced by 1,500 or less to 2,500 or more planters with about

2,000 as the best point estimate.

The mill produces starch from the cassava tubers. It ships the starch in powdered form to the Metro Manila area where it is marketed. Other companies also mill cassava in various Philippine locations. Mill by-products could generate many new industries. Several of these other products, actually marketed abroad or practicable for production, given steady market demand, are: (a) food products (tapioca, breakfast foods such as toasted flakes, crackers and crisps, as well as foods in which starch is an important ingredient such as puddings, custards, sauces, cream soups, and gravies); (b) adhesives, glues, wall paper paste, and dextrins; (c) starch additives utilized in making paper and textiles; (d) containers or receptacles for explosive materials, used in the manufacture of explosives; (e) materials used in the tanning of leather, and (f) cassava material used in the production of ethyl alcohol. Cassava products are also useful for the cooling of industrial drills.

Like corn, the dry milling of cassava to produce starch is rarely attempted, because the product of this process is inferior to wet-processed starch. Instead cassava tubers are washed, weighed, placed upon feeders, and introduced into tanks where they are rasped with water or crushed, after which the starch is permitted to settle to the bottom. The starch is then dried to the point where it can be crumbled by pressing it through sieves or perforated metal plates. The material resulting is then subjected to tumbling, upon canvas-covered frames which provide rotary motion, or in steam-jacketted cylinders. As a consequence, the starch particles assume a round, pellet-shaped form, and are partly gelatinized as they dry. More modern factories may be equipped with special sieves for shaking or rotating the starch and with improved settling tanks. In larger mills, centrifuges are at present replacing settling tanks.

EMPLOYMENT

Unlike sugar, which generally requires small inputs of labor except at the annual harvest period, and which tends to be grown by owners on larger areas through agricultural workers,² (per

2. The average sugar area per planter in 1981-82 was 17.6 ha.—16,200 ha./918 planters.

planter in 1981-82 was 17.6 ha.—16,200 ha./918 planters). Bukidnon cassava farmers are more characteristically small independent farmers, or are tenants, working farms varying in size from one to three hectares. Thus the farmers are largely self-employed, and on the same farm are also likely to raise upland rice and/or corn. They obtain all or some of their family food needs from these farms, as well as a cash return from sales of tubers to the factory.

Thus it is difficult to estimate employment generated by the cassava industry because it is a part-time undertaking, while the intensity of culture required for cassava production is not nearly as great as that required for upland rice or corn (especially for lowland or paddy rice). However, cassava culture in 1982-83 provided part of the full-time employment of some 2,000 farmers and tenants (plus or minus 500), on an on-going basis. In addition, at harvests, it may provide further employment to laborers. It also does this in a manner that assists small owners to increase incomes by supplementing rice and/or corn production on their farms with cassava production at times when rice and corn labor demands are lighter. In short, cassava production does not so much supplant rice and corn production, as it supplements these crops. It provides for more intensive labor-absorption capacity on the small farm for the owner and his family, increases his economic returns by adding another crop to his produce, and in times of drought or other emergency, gives his family a food fall-back position in cassava, which is a nourishing dietary component.

Phil-Agro reports that it employs about 180 persons. Some of these persons are employed in the factory milling process, some as executives and office workers, others as technicians and utility workers, and others as field workers, on the approximately 500 hectares of land upon which the company itself produces tubers.³

TAXES

The Phil-Agro Corporation as a much smaller and at present struggling industry cannot be expected to rival BUSCO (Bukidnon Sugar Milling Co., Inc.) as a dollar earner, or as an equally large supporter of the government through its taxes. Nevertheless, it

3. Provincial Development Staff, Bukidnon, "Provincial Development Investment Program (1983-1987)," 2 parts, Malaybalay, 1982. (Mimeographed.)

has made substantial real estate tax contributions to the Municipality of Baungon over the past several years, averaging from ₱60 to ₱80 thousand in recent years, in addition to the two-percent production tax. (Land planted to cassava is assessed for real estate tax purposes at a higher level than is land used for nonirrigated rice and corn.)⁴

The world market price of cassava starch fluctuates considerably. The movement was downwards from 1976 through 1978. Prices began to improve in 1979 and increased from ₱108.43 per 50 kg. to ₱142.67 in 1981, an increase of about 9.6 percent per year. Thereafter, prices again declined approximately 30 percent. The price Phil-Agro paid for cassava tubers was affected by these wholesale price changes. In 1981, Phil-Agro had paid 25 centavos per kilo for tubers. By 1982, the price they were paying had declined to 22 centavos, a decline of about 12 percent from the 1981 level.

Phil-Agro believes it necessary to maintain supply levels by holding its price for tubers at this level. Thus although they state that they are losing money at present in the pinch between buying price per kilo and wholesale price of their product, they have continued to offer this price for cassava tubers. The price, although lower than the 25 centavos of 1981, still permits farmers to earn more than they would from growing corn (or upland rice). At 22 centavos per kilo, the farmer gets ₱220 per metric ton of cassava tubers. He can average about 15 metric tons per hectare. (Phil-Agro's experimental farms average 40 metric tons per hectare. Thus increased yield is a real possibility). At ₱220 per ton, the farmer can average ₱3,300 per hectare. The Bukidnon corn farm can average about 18 cavans per hectare. (Provincial Development Staff, Bukidnon, 1982). The National Food Authority's buying price in 1982 was about ₱1.30 per kilogram of shelled corn depending upon quality and moisture content, a price that can represent a floor value for farmers selling to middlemen (from whom they might get somewhat more or somewhat less, depending upon the supply and demand). At this price, a Bukidnon corn farmer could average ₱1,404 per hectare, plus or minus 10 percent, for a cavan of 60 kilograms. Upland rice commands a

4. Office of the Provincial Assessor, "Schedule of New Market Values," Appendix E:I, *Agricultural Lands: Values per Hectare*; II: *Agricultural Lands: Productivity Class*, Malaybalay, 1983. (Typewritten.)

higher price than corn, but over a year the production of palay per hectare is correspondingly less than corn, and the total income either less than corn income or about the same but with more labor inputs. Usually two crops of corn a year are feasible. Cassava can be intercropped with corn so that a small farm can provide food for the family (corn plus cassava) and two cash crops—one seasonal and the other (cassava), a perennial. An added advantage for somewhat larger farms is legal. Corn farms are subject to implementation of the land reform law. But if they also grow cassava, they escape the provisions of this law.

Contracts to grow cassava for the Maasin Mill are at present more favorable to the farmer than sugar contracts with the BUSCO because they are one-year contracts, renewable at the option of both parties. If the price of corn rises to a point where its production has a comparative advantage over cassava, the farmer has no legal problems in shifting to corn.

Phil-Agro advances credit (about ₱700,000 has been given so far) to cassava farmers for fertilizer and land preparation costs for cassava planting. As long as a farmer maintains a contract with the mill, he can obtain this credit, and can be sure of a market for this crop. Phil-Agro also provides instruction through its experimental farms on better production techniques and fertilizer use. Twelve agricultural technicians are provided by Phil-Agro for this purpose.

A possible dysfunction of the Maasin Mill should be mentioned. *The Mindanao Journal* (12 November 1982) reported that residents of areas along the Cagayan River and the Maasin Creek, its tributary, have strongly reacted to the alleged dumping of mill wastes into the creek (which might contain considerable amounts of butyric acid). These residents allege that the mill operates without proper anti-pollution devices. They charge that the plant, when operating, discharges approximately 600 gallons of waste per hour into the Creek, and that this waste material affects marine life in the river (algae, vegetable growth supplying fish nutrition, and the fish themselves), apparently because oxygen bubbles in the water are rendered nonusable by the marine life or diminished in quantity and quality.

MACRO-LEVEL ECONOMIC ANALYSIS

The same hypotheses based on consumer theory, constructed for assessment of the sugar industry, are applied to the cassava

industry of western Bukidnon and neighboring localities. Briefly, these are:

1. The demand for cassava industry benefits will engender a significant increase in volume of migration to western Bukidnon.
2. The demand for these benefits will also be revealed by the increase in number of cassava planters.
3. This demand will also be mirrored in the increased hectareage devoted to cassava.
4. This demand will appear in the increases in cassava tuber production since the factory began operations.
5. The production of corn and upland rice will decrease over the same years as more land is planted to cassava.
6. The hectareage planted to corn and upland rice will decrease in competition with the land planted to cassava.

On the supply side of consumer behavior theory, the hypotheses relevant to cassava were:

1. The income of cassava planters will grow beyond the potential income from the same land for corn or upland rice.
2. Labor will find a large increase in full-time employment opportunities from the first operations of the starch factory.
3. The real level of western Bukidnon labor income will be found to have increased rapidly.
4. "Labor" households will evaluate the time since 1978 as socially and economically "better" than the period before establishment of the starch factory.
5. Higher tax payments, which are indicators of planter and community income, will be found to have been made by municipalities where volume of cassava production is higher.
6. Foreign exchange earnings of the government will be augmented by a substantial sum because of west Bukidnon cassava production.

Demand hypotheses 2, 3, and 4 are supported by the data already given. The area planted to cassava did increase from about 1,000 hectares in 1978 to approximately 3,500 hectares in 1982. The number of cassava planters did increase up to about 2,000 in 1980 from a small start in 1978. And the volume of cassava starch manufactured undoubtedly increased, 1978-82, since the volume of cassava tubers bought by the mill and/or processed grew from 6,000 to 45,000 metric tons. While these increases are not nearly

as spectacular as those of the sugar industry, they still support the hypotheses.

No data has been obtained to support hypotheses 5 and 6. Western Bukidnon farmers often intercrop cassava with corn or upland rice and accordingly the amount of decline in hectares planted to corn and rice, if any, is hard to obtain. As for production, while metric tons of corn and upland rice may have decreased somewhat in western Bukidnon, this is difficult to verify in view of the relatively small amount of land utilized for production in the first two years of operation of the cassava factory, the drought of 1982-83, and only two remaining years of crop production. The hypothesis on migration will be treated in the demographic section.

From the supply side, hypotheses 1, 2, 3, and 5 receive some support from the data, but not as strongly as worded. Hypothesis 6 is not supported.

First, it is clear from the growth in area devoted to cassava production that cassava planters were receiving more for their corn and/or upland rice plus cassava tubers than they were receiving from the corn and/or rice alone. The increase in number of cassava planters over the five years till 1982 reinforces this conclusion. While planters might mistakenly plant a crop giving less returns for one season or even a year, they would hardly do so for five continuing years, particularly farmers, who are famed for their practicality.

The second hypothesis was supported in the sense of increased profitable employment. The majority of the farms in western Bukidnon are small farms worked by the family that owns them. The farmer therefore principally increased his own employment and that of family members on the farm. This meant that he was able to increase his crop-oriented working days on his own farm. However, the hypothesis was not supported in the sense that a large number of new full-time jobs were generated by the cassava industry. Aside from opportunities on some of the larger farms for more tenants or laborers, the only other large source of new employment found by the researcher was the starch factory itself which employs about 180 persons in connection with its various technical and agricultural operations.

The real level of western Bukidnon labor income in the Baungon region did increase but not quite "rapidly" as hypothesis

3 asserted. Mill technologists and agriculturists, of course principally experienced a straightforward income increase (otherwise they would not have taken the job). Tenants and laborers however also experienced growth in income. They either obtained larger shares of crops (corn, dry rice, or cassava) for accomplishing larger workloads, or received more wages for longer hours of employment. The increase was not very large in their case. Owners experienced the largest increases, and since a great many such owners were quite small owners (less than 5 hectares), this can be considered an increase in labor income.

As for taxes, hypothesis 5, Baungon Municipality, site of the Phil-Agro factory located in Sitio Maasin of Nicdao Barrio, does not appear to have made as large tax payments as thirteen of the other twenty-two Bukidnon municipalities. And it paid considerably less taxes than the average municipality. Thus the hypothesis must be rejected in that sense. On the other hand, Phil-Agro, a private corporation, has paid an average of ₱60 to ₱80 thousand in taxes during the recent years of its existence. In addition it has paid the two-percent production tax. Further, the real estate tax for land planted to cassava was higher than that paid for farm land planted to dry rice and corn.⁵ These taxes are larger than could be expected from the many corn and dry rice farms without the cassava tubers and without the mill.

Hypotheses 6 was not sustained. Phil-Agro was having all it could do to meet competition for the Philippine market, despite its privileged position with regard to travel time and distance to the Philippine markets. It could not meet the competition of Thailand and other nations on the world market.

Hypotheses 1 and 4 are more conveniently treated under the micro-level rubric. Thus, this section may be terminated with the above conclusions.

MICRO-LEVEL ANALYSIS

Four barrios were selected for study. They were: (1) Lumbia, approximately 15 kilometers from Cagayan on a well-travelled, well-maintained asphalt road. Lumbia raises corn and cassava. (2) Imbatug Poblacion, approximately 25 kilometers from Cagayan.

5. Ibid.

One drives past Lumbia, down a hill, over a bridge across the Cagayan River through Maasin Sitio of Nicdao Barrio, and then over a long winding road up through hills until reaching a plateau on which Imbatug, the town center of Baungon municipality, is located. (3) On the way to Imbatug, after climbing part of the way up through the hills toward that town center, one turns right, descends into a valley where the road bridges a moderate-sized stream, and then proceeds 4 to 5 kilometers further to Lingating. Altogether the distance from the first bridge might be 6 to 8 kilometers. The road from the second bridge to Lingating is not very good. (4) From Imbatug one travels approximately 8 to 10 kilometers further across a plateau, mostly on a bumpy dirt road to Salimbalan.

Of all respondents, only 22 percent had been born in the barrio of residence at interview. An additional 4 percent, making 26 percent in all, had been born in the municipality of interview. Ten percent had migrated to the barrios of residence from other Bukidnon municipalities. Of the remainder, 48 percent had been born in Misamis Oriental, and 16 percent had come from more distant places. On the basis of this set of data alone, one might judge that the cassava industry had attracted most of these migrants to their barrios of residence at interview. After all, 78 percent were in-migrants. However, it is also necessary to ask in what year did each of these persons migrate to their present residence. If they had migrated before 1978, it was not the profits or employment, to be obtained because of the cassava industry, that was the motive.

When the data are broken down in terms of year of arrival in present barrio of residence, the distribution of migrants shows that 20.5 percent of all migrants (16 percent of all residents) did migrate to their present barrio in or after 1978. This would presume an annual rate of migration over the five years, 1978-82, of about 4.7 percent. This is more than the average annual growth of Bukidnon Province, 1970-80, 4.3 percent. Thus the cassava industry may have been responsible for adding about four-tenths of one percent of the annual average net in-migration to western Bukidnon during these years. This could equal some 2,000 persons per 100,000 residents in five years which would by no means be negligible. But it would hardly constitute a flood tide into the Baungon area. The conclusion is that the data are compatible

with the hypothesis of a moderate in-migration to the cassava-raising areas of Bukidnon.

The fourth supply-side hypothesis states that labor will evaluate the period since 1978 as "better" from a social and economic point of view. In early 1983, when the survey was in the field, early effects of the drought were being experienced, but by March 31 not nearly to the extent that they could have conditioned response by May 1983. The Aquino assassination and the associated economic crisis, of course, had not taken place as yet.

First, response is shown to the item: Has your standard of living remained pretty much the same as before 1978, or has it improved, or has it declined?

| <i>Name of Barrio</i> | <i>Standard of Living Has</i> | | |
|-----------------------|--------------------------------|-----------------|-----------------|
| | <i>Remained About the Same</i> | <i>Improved</i> | <i>Declined</i> |
| Salimbalan | 12.5 | 0.0 | 87.5 |
| Lumbia | 11.1 | 44.4 | 44.4 |
| Lingating | 28.0 | 16.0 | 56.0 |
| Imbatug | 0.0 | 12.5 | 87.5 |
| All Barrios (n=50) | 18.0 | 18.0 | 64.0 |

The data of this table do not support the hypothesis. It is possible of course that respondents are replying in terms of the prevalent political and drought situations, but whatever the reason, these data do not indicate better economic conditions. Clearly, the residents of western Bukidnon regard the cassava industry as more advantageous to them than the people of southern Bukidnon regard the sugar industry. Many more persons, relatively, in the western Bukidnon sample felt that increased income had reached them because of the cassava industry, than residents of southern Bukidnon felt that their household income had increased because of the sugar industry. Many fewer residents of the west said they knew of no benefits reaching their families from the cassava industry in comparison with the number of south Bukidnon residents who said this of benefits of the sugar industry. No resident of western Bukidnon said that no benefits from the cassava industry were reaching them, but a substantial proportion of south Bukidnon residents said this. One gets the impression that western

Bukidnon residents regard the cassava industry as "their own" industry while the south Bukidnon people at large regard the sugar industry as belonging to others, a select group, for whom they work or would like to obtain work, but with whom they identify themselves only weakly. In general, then, these latter data for western Bukidnon appear to provide some support for the hypothesis of increased labor income, although they do not make clear the extent of gain.

An examination of estimated median income for the two sets of study barrios will be useful at this point.

Southern Bukidnon

| | |
|------------|--------|
| Butong | ₱7,600 |
| Bagonta-as | 5,800 |
| Dagumba-an | 5,200 |
| Macaopao | 4,850 |

Western Bukidnon

| | |
|------------|--------|
| Imbatug | ₱5,000 |
| Lingating | 4,850 |
| Lumbia | 5,000 |
| Salimbalan | 4,850 |

One notes that average median income is higher in southern than in western Bukidnon. How then would farmers in southern Bukidnon be more dissatisfied with their standard of living than those of western Bukidnon? The data makes clear two important differences between the two sets of households. Those in southern Bukidnon are quite diversified as to occupation. Only 56.5 percent were farmers. Of these farmers, 63.6 percent were owners and an additional 80 percent were part-owners. But in western Bukidnon, 84.0 percent were farmers, and of these 69.0 percent were owners while 4.8 percent were part-owners.

In short, there were relatively many more farmers in western Bukidnon, and of these more were owners. Thus more households in western Bukidnon were helped by the added income from cassava (which mainly was cultivated on small farms, averaging 3 hectares or less). In addition, cassava and cereals from these owner households were able to supply food to these families for consumption purposes. Thus one judges that there was more "trickle down" of profits and benefits from the cassava industry of western Bukidnon upon average Bukidnon households of lower economic status than there was from the sugar industry in southern Bukidnon. In southern Bukidnon, more former tenants had lost tenancy rights, because of the conversion to sugar than had been lost in

western Bukidnon, more households had no land from which to satisfy their own food consumption needs, and relatively few of the small farmer class (less than 3 hectares) had shared in the profits from sugar production. Another reason is suggested by the data. A greater mix of occupations and incomes appears in southern Bukidnon than in western Bukidnon. Many of the south Bukidnon occupations are more prestigious, and their incomes much higher.

One can thus expect residents of southern Bukidnon to feel a greater sense of *relative deprivation*. Comparing themselves to households they see about them in their daily life, they realize they lack many of the pleasures and amenities possessed by these fellow residents. Thus they feel more deprived, relative to the good things enjoyed by fellow residents (house, clothes, properties, foodstuffs, etc.). Such a sense of relative deprivation appears a less likely experience in western Bukidnon and seems less likely to be felt, since households seem less separated by prestige and other social distance distinctions. Nevertheless, the conclusion appears to be that the income and livelihood of farm households in western Bukidnon were more benefitted from the cassava industry than the income and livelihood of farm households in southern Bukidnon were benefitted from the sugar industry. In this limited sense, the fourth supply side hypothesis from consumer behavior theory appears to be supported. However, in neither area has the real income of the small farmer of the lower economic class increased "rapidly."

DEMOGRAPHIC ANALYSIS

The supply side of the population-development relationship will be considered first. That is, the effects of the cassava industry upon rates of fertility and mortality will be considered. Migration from this point of view has been already treated in the micro-level economic analysis.

If the cassava industry had had a dampening effect upon fertility, one may imagine this coming about through the indirect effects of increased income (both from increased wages or profits and from increased food for home consumption from the farm, thus freeing income for other uses). Whatever the source of fertility decline may be however, the first task must be to see if a decline has occurred in western Bukidnon beyond what might be

expected from the national family planning program operating without the assistance of the cassava industry.

We begin with an examination of the percentage age distributions of the married female respondents of households interviewed in southern and western Bukidnon. The means are significantly different at .05.

| <i>Ages</i> | <i>Southern Bukidnon</i> | <i>Western Bukidnon</i> | <i>Both Sets</i> |
|--------------------------|--------------------------|--------------------------|------------------|
| 15-19 | — | 2.6 | 0.6 |
| 20-24 | 10.8 | 5.1 | 9.6 |
| 25-29 | 25.9 | 10.3 | 22.4 |
| 30-34 | 18.7 | 23.1 | 19.6 |
| 35-39 | 18.0 | 5.1 | 15.2 |
| 40-44 | 11.5 | 20.5 | 13.5 |
| 45-49 | 15.1 | 33.3 | 19.1 |
| 15-49 | 100.0 | 100.0 | 100.0 |
| Mean Age, S. Bukidnon: | 34.4 | Mean Age, W. Bukidnon: | 38.4 |
| Median Age, S. Bukidnon: | 33.5 | Median Age, W. Bukidnon: | 40.9 |

The crude birth rates computed from the household data, per 1000 persons (with southern Bukidnon as comparative data) were:

| <i>Southern Bukidnon</i> | | <i>Western Bukidnon</i> | |
|--------------------------|------|-------------------------|------|
| Bagonta-as | 31.5 | Imbatug | 35.7 |
| Butong | 41.9 | Lingating | 28.0 |
| Dagumba-an | 30.5 | Lumbia | 22.7 |
| Macaopao | 19.0 | Salimbalan | 8.9 |

These rates for most barrios are too low. The barrios are rural and somewhat isolated. The result probably was affected, in addition to sampling error in a small population by (1) forgetfulness to mention deceased neonatal births, (2) errors of respondents in bounding the two-year time frames, and (3) in western Bukidnon, the ages of the particular sample of women interviewed. What the data suggest, although not without questions, is that rates of the western barrios might on the average be lower than those of the southern Bukidnon barrios. That is really as far as one can press the existing data.

Probably, the most convincing test of this hypothesis is to examine the family planning data for each set of barrios. Current use of family planning at time of interview was the question asked:

| | <i>Southern Bukidnon</i> | | | | <i>All Southern</i> |
|--|--------------------------|------------------|-------------------|-------------------|---------------------|
| | <i>Bagonta-as</i> | <i>Butong</i> | <i>Dagumba-an</i> | <i>Macaopao</i> | <i>Barrios</i> |
| Users | 40 | 48 | 32 | 12 | 36.0 |
| Non-Users | 42 | 42 | 46 | 52 | 44.6 |
| Not applicable (Overage, Sterile, Widowed) | 18 | 10 | 22 | 36 | 19.4 |
| | 100 | 100 | 100 | 100 | 100.0 |
| | <i>Western Bukidnon</i> | | | | <i>All Western</i> |
| | <i>Imbatug</i> | <i>Lingating</i> | <i>Lumbia</i> | <i>Salimbalan</i> | <i>Barrios</i> |
| Users | 50 | 12 | 0 | 25 | 18.0 |
| Non-Users | 25 | 80 | 67 | 25 | 60.0 |
| Not Applicable (Overage, Sterile, Widowed) | 25 | 8 | 33 | 50 | 22.0 |
| | 100 | 100 | 100 | 100 | 100.0 |

From this table, we find that the relative number of those currently using family planning is greater in southern Bukidnon than in western Bukidnon. In fact, where the data are looked in this way, twice as many couples are seen to be using family planning in southern Bukidnon.

However, some small reason for the low fertility in western Bukidnon is also apparent in the table. The proportion of women who are sterile, too old to conceive a child, or widowed is also larger in the western Bukidnon sample. Apparently, more wives of household heads in the cassava area of Baungon married early, had their children and now are no longer able to bear enough children to maintain high fertility. The percentage difference however is not large, 2.6 percent.

On the basis of these family planning data, one can conclude safely that the reason for the apparent lower fertility in western Bukidnon is age/sterility, failure to recall all children born as well

as errors in judging dates of birth relevant to the two-year time boundaries. Nothing in these data on use of family planning would lead one to conclude fertility is lower in western Bukidnon.

The conclusion reached is that the cassava industry through the additional income and employment benefits it appears to have provided has not substantially affected level of fertility. Perhaps the income benefits are not yet great enough to raise most households over the income threshold that Dr. Jose Encarnacion of the U.P. School of Economics has hypothesized. In fact, the level of prevalence in western Bukidnon could be satisfactorily explained by the efforts of outreach workers of the national family planning project, without assistance from the cassava industry.

MORTALITY

Another population process that may have been affected substantially by increased income and/or nutrition in western Bukidnon is mortality. Increased income makes medicines and medical care more feasible, and increased and varied nutrition can increase the body's strength and powers of resistance to infectious disease.

Various rates were computed, including infant mortality and central death rates for the following categories: children under one year of age, children under five, and for all ages (crude death rates). For infants mortality no reported deaths had occurred in three of the barrios, and thus no rate could be computed. The same was true of the central rates for children under 1, and under 5. Two barrios reported no household deaths at all. But the rates for Imbatug and for Lumbia were 17.8 deaths and 11.4 deaths per 1000.

Thus rates are presented for a single western Budkidnon cassava area:

| <i>Infant Mortality</i> | <i>Central Death Rates</i> | | |
|-------------------------|----------------------------|----------------|-----------------|
| | <i>Under 1</i> | <i>Under 5</i> | <i>All Ages</i> |
| 133.3 | 125.0 | 32.3 | 4.8 |

The infant and child rates are quite high, while the crude death rate is too low. Rural farm death rates, especially when combined with low level of mother's education, have been found high, however, in the limited mortality research that has been carried out

in the Philippines, The crude death rate is too low on the other hand. Time frame errors for recalled deaths over a two-year period could account for this phenomenon when added to the sampling variability of a small mortality sample. Deaths that actually occurred 3 or 4 years ago could be pushed closer in time by faulty recollection, especially where no written family records—like notations of dates in a family bible—are kept, as is common among poorly educated rural folks. The infant mortality rate for the Philippines has been estimated at about 50 deaths per 1000 live births by ESCAP,⁶ and the crude death rate at 9.3 per 1000 by U.P. DRDF.⁷ While Adlakha and Suchindran estimate the ratio of infant mortality in white collar to agricultural households for two nations at from 1.28 to 2.25, still 133.3 is beyond the higher of these ratios.⁸

More likely, the infant mortality for these agricultural and somewhat isolated communities would average about 65 to 80 infant deaths per 1000 live births, the crude death rate from 11 to 13 deaths per 1000 persons of all ages, and the rate for children 1-4 years of age would average about 6 to 8 deaths per 1000, and, for children 0-4, about 60 to 85 per 1000.

If one assumes that rural children under one year of age are mainly breastfed, whereas children one to five years of age live on the regular family diet, it is likely that the probably increased income from cassava production and sale of small farm households has bettered health of mothers and therefore the quality of their breastmilk, and has bettered the nutrition of these households, resulting in a small decline in mortality. The data however do not show mortality levels that would indicate the occurrence of such a decline. Thus no sure conclusions can be drawn from the data with regard to the increased income obtained by adding cassava to the corn production of west Bukidnon small farms.

Finally, the table below compares these mortality data from western Bukidnon with those for southern Bukidnon:

6. Population Division, Economic and Social Commission for Asia and the Pacific, *1983 ESCAP Population Data Sheet* (Bangkok, 1983).

7. UP Demographic Research and Development Foundation, Inc., "The Philippines" *Philippine Population Journal* 1, 1.

8. Arjun L. Adlakha and C.M. Suchindran, "Correlates of Infant Mortality: A Comparative Study of Sri Lanka and Jordan," paper presented at the IUSSP General Conference, Manila, Philippines, 9-16 December 1981, Table 2.

| | <i>Mortality Rates</i> | | | |
|-------------------|------------------------|--------------|------------|--------------|
| | <i>Infant</i> | <i>Under</i> | <i>0-4</i> | <i>Crude</i> |
| Southern Bukidnon | 109.6 | 100.0 | 29.1 | 16.5 |
| Western Bukidnon | 133.3 | 125.0 | 32.3 | 4.8 |
| Overall | 113.6 | 104.2 | 29.5 | 15.0 |

In every category except crude death rates, southern Bukidnon exhibited lower mortality than western Bukidnon. Since the rates of southern Bukidnon itself exhibit higher than average mortality for the Philippines, they present another reason for concluding that the data for western Bukidnon do not show any decline from expected levels because of cassava income and benefits.

DEMAND-SIDE OF THE POPULATION-DEVELOPMENT RELATIONSHIP

The foregoing section has treated the supply side of the population, its growth due to an excess of births over deaths, and its additional augmentation through net in-migration. This results in a supply of labor for the cassava industry to be employed in connection with cassava production.

However, the demand side of the relationship also deserves comment. The need of the industry for labor to produce implies a certain demand for labor to plant, cultivate, and harvest cassava tubers. Apparently the supply more than meets the demand, which means that the competitive position of labor in the market is poor and that the price of labor will be low. The high birth rate, the large annual natural increase, and the high rate of the general migration into Bukidnon over the past ten years operate towards maintenance of this excess labor situation. The fact that most cassava-producing farms are less than five hectares in size further reinforces this situation. Most small farm households supply their labor from their own family members. The high level of mortality is more than absorbed by the birth rate, but the high morbidity level tends to depress the efficiency of labor by producing more physically handicapped persons, by inflating absenteeism from work, and by weakening the strength and energies of members of the labor force. Thus while the economic institution, in this case the cassava industry (planters, factory, and labor force), benefits by the cheap labor situation which results, the benefit is not unmixed. The resulting labor force is apt to be less efficient.

We may summarize the benefits and problems of the cassava industry as follows:

1. The industry presents small-scale as well as large-scale farmers in western Bukidnon with the possibility of a second cash crop, and thus provides them with greater financial security, and also with a second type of food staple which may substitute for the cereals in poor cereal crop seasons.
2. The industry tends to operate through small-scale farmers, mainly, (less than five hectares) and thus should tend to raise income among this very numerous and therefore very important category of lower-income households. Thus it tends to raise the income level of the poorest segment of the population. Thus the profits of the industry tend in fact to trickle down to the lower class. This promotes not only better purchasing power in the lower economic class and thus a larger market for manufacturing enterprises, better nutrition through increased household food supplies, better education and better health because of greater ability to pay, but it also promotes a healthier and sounder economic climate which is conducive to social order and tranquility and a minimum of social unrest and violence.
3. The cassava industry up to late 1982 definitely was profitable to planters. This is evident in the increase in hectareage utilized for cassava production, and in the growth in volume of the tubers milled.
4. Cassava can be intercropped on the same parcel of land with corn, upland rice, bananas, and other crops. This is a distinct advantage as it protects the soil better (because of its leafy perennial nature) from erosion than corn or other crops requiring a "clean" culture. Farms thus growing cassava are also exempt from the provisions of the land reform law.
5. The cassava industry increases employment in the laboring class, mainly however through providing small farmer-owners with a means of expanding number of days of profitable employment upon their own farms.
6. The prices (in 1982) paid by Phil-Agro were still profitable at ₱0.22 per kilo of tubers to the small farmer despite the decline in price from ₱0.25 in 1981 to only ₱0.22.
7. Phil-Agro supplies crop assistance credit to farmers con-

tracting to supply Phil-Agro with cassava tubers.

8. Contracts are for one year only. Thus in the event that Phil-Agro cannot provide price levels for cassava upon which farmers can make a profit, no legal difficulties will prevent farmers from turning back to corn or rice or to another crop.
9. The Phil-Agro has paid substantial taxes to the national treasury. ₱60-80 thousand in recent years.
10. Like the sugar industry, cassava factory by-products present possibilities for the development by entrepreneurs of new industries beyond cassava starch, utilizing these by-products materials. Some of these possible industries are:
those manufacturing adhesives, glues, wall paper pastes, and dextrins; those manufacturing containers or receptacles for explosives; those manufacturing materials used in the tanning of leather; those manufacturing ethyl alcohol; those manufacturing food and food ingredients such as tapioca, breakfast-foods like toasted flakes, crackers, and crisps; ingredients for custards, pudding, sauces, gravies, and cream soups, etc.

The disadvantages associated with the cassava industry thus far have been:

1. Its inefficiency in production costs because of which even at home in the Philippines, it can compete only precariously with Thai starch produced a thousand miles away. This may partly be due to Bukidnon soils poorer in the elements needed for abundant cassava production. But Phil-Agro can produce competitive quantities on its own farm parcels with better technologies and proper fertilizer and cultivation inputs. Thus the difficulty seems to be lack of know-how on the part of small farmers and lack of input materials. This situation seems remediable.
2. The relatively small scale of its operations because of which it can benefit fewer households in western Bukidnon than it potentially might. However, this problem of scale may improve of its own nature if the industry can become more efficient and begin to compete with Thai cassava starch not only in the Philippines but abroad.
3. The dumping of an alleged 600 gallons per hour of butyric acid and other factory wastes into the Cagayan River

through its tributary, the Maasin Creek, which is alleged to have greatly damaged riverine fisheries and other marine life (algae, etc.). The allegation that oxidation bubbles, because of wastes (especially butyric acid), are rendered unavailable to marine life may possibly be incorrect. Even so, however, one would suspect that untreated wastes in the bulk described, poured into the river, presumably at very high temperatures, would be ecologically destructive, and should be subjected to regulation.

CONCLUSION

This second article on agribusinesses in Bukidnon Province has, like the first article on the Bukidnon sugar industry, found the results to be something less than an unmixed package of blessings. Philippine cassava starch has trouble competing with foreign competitors who produce tubers more efficiently. As a result, the future of this industry is somewhat doubtful. In addition, if not regulated, the waste products of such agribusinesses may be a cause of pollution to the environment. Further, cassava is a crop which can be hard upon the soil in which it is grown, and which therefore requires careful planning in terms of rotation of crops and of return to the land of the nutrients which long-term, efficient farmland usage calls for.

Thus the emphasis of the present national administration upon agribusiness as the prime vehicle for attainment of economic recovery during the next three to five years, is an emphasis that needs careful study, planning, and monitoring lest it contribute further to the damage and destruction of the natural resources that has taken place over the past forty years.