

The Making of Cocaine in the Jungle

All of the illicit cocaine entering the US and Europe comes from South America where it is processed in makeshift jungle laboratories. These are located close to growing areas because the leaves are hard to transport far, owing to their weight (it takes 200–300 lb of leaves to make a kilo of cocaine) and the inability to conceal them easily. In contrast to the common laboratories with clean buildings, a lot of expensive glassware and doctors with white lab coats on, most cocaine labs look a lot different. They are equipped with a few plastic buckets, some acid, some alkali, and one or two cooks (“cocineros”), the underground chemists “all they need to make cocaine is a couple buckets and a sheet”. These labs are only in operation for a short period of time (2 weeks or less) two or three times a year during the harvest.

These labs are meant to extract the alkaloids from the coca leaf, which yields a mixture of several alkaloids and oils from the leaf. This process is usually carried out at or near the growing areas. With a yield of about 1% cocaine per leaf, it takes 200–300 lb of leaves to make a kilo of crude cocaine (Table 1). The leaves are put in a pit or drum and mixed with calcium carbonate, then left to stand in the sun for a few hours so that the calcium carbonate will “soften” the leaves and cause them to “sweat” their alkaloids out. This process is known as “La Salada”, the “salting”. The leaves are then soaked (“La Mojadura”, the “soaking”) in kerosene (or gasoline if that’s what’s available), which will dissolve the alkaloids. The leaves are then pressed to recover the kerosene, known as “La Prensa” the “pressing”, and thereafter are discarded (Fig. 20). Water, with diluted sulphuric acid is added to the kerosene, and since the mixture is now acidic, the alkaloids precipitate from the kerosene, and they will dissolve in water, a process called “La Guaraperia”, or the “separation”. The kerosene is now poured off, and the water (now containing the dissolved alkaloids) is made basic by adding an alkali (ammonia). This will cause the alkaloids to precipitate, after which they are filtered usually with a sheet stretched between four sticks, wrung dry and left under a lightbulb or the sun to dry thoroughly. This process is called “La Secaderia”, or the “drying”. The resultant product is known as “Coca Paste” or “Pasta”, the alkaloidal cocaine. However, this alkaloidal cocaine should not be confused with cocaine base, because being contaminated with other by-products it is not as pure as the high quality cocaine base, which is yielded by the next step in the refining process.

Table 1 The table outlines the first of three steps usually taken in the refining of illicit cocaine. This step is directed at obtaining “Coca Paste” also known as “Pasta”

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- *Coca leaves + lime (carbonate) are soaked in kerosene (24–36 h)*
 - *Leaves are separated (pressed) from kerosene & discarded*
 - *H₂O + diluted sulphuric acid is added to kerosene which will result in the precipitation of Coca alkaloids from kerosene and dissolving in the water*
 - *The water (containing the alkaloids) is separated from kerosene*
 - *Alkali (ammonium hydroxide) is added to the water in order to precipitate alkaloids*
 - *The precipitate is filtered and dried in the open, which eventually will lead to the valuable Coca Paste – “Pasta”*
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Fig. 20 A “cocinero” pressing the soaked leaves to separate out the kerosene containing the alkaloids (“La Prensa”) in a typical cocaine jungle laboratory

Steps Refining Coca Paste to Cocaine Base

Following harvest of the leaves and the steps to get crude cocaine paste, is the refining process to yield cocaine base. The refining process of illicit cocaine is quite different from the process used to make pharmaceutical-quality drug. There, in the ecgonine conversion process for making medicinal cocaine, the total alkaloid content is extracted from coca leaves, usually *E. javanese*. This extract is saponified, yielding ecgonine as its main product, which then is refined by recrystallization. The resulting high-grade ecgonin then is reacted with benzoyl hydrochloride and with methanol and thus is converted to cocaine.

The illicit process, however, tries to preserve the naturally occurring cocaine and avoid its degradation into ecgonine. The purification is performed through the steps extraction, precipitation, solution and again precipitation, as outlined above. And although the illicit chemist (“cocinero”) attempts to exclude all other alkaloids from the final product, this never happens completely. With at least 14 alkaloids found in coca leaves, there will be some (at least trace amounts) present in the resulting cocaine. Hence it is rare to find illicit cocaine that is more than 95% pure. It must also be remembered that the residues of chemicals such as benzene, acetone, sulphuric and other acids and even kerosene and gasoline and their additives will often be identified as impurities.

Coca paste or “Pasta” is the result of the first step in the refining process, As mentioned before, this is a mixture of alkaloids including cocaine with a beige color. If the leaves used to make the “Pasta” were of exceptionally high quality (Huanaco or Bolivian leaves) with a 90% cocaine to other alkaloids content, this “Pasta” might not have to be further refined into cocaine base, as it would already be 90% cocaine anyway. In that case, the chemists would simply add hydrochloric acid to the “Pasta”, which would result in the finished product – cocaine hydrochloride or street coke. However, this is rare, as most illicit labs don’t get leaves that are of high quality, so they must perform another step in the refining process to obtain cocaine base. It should be noted that while much of the “Pasta” produced is eventually converted into cocaine base and then to cocaine hydrochloride, a fair amount of this Coca Paste is diverted for local consumption. As has been stated already, the melting point of the cocaine base is 98°C, while cocaine hydrochloride melts at 190°C. It is because of this difference in the melting point that cocaine base is suitable for smoking (because it sublimates easily) a process known as “Basuko”. This has become a tremendous public health problem in the producing countries themselves, accounting for severe dependence and side effects – due not only to the cocaine, but to the contaminants of the manufacturing process, especially lead from kerosene and gasoline additives. A second step is usually necessary, because the coca leaves used to make the Coca Paste, or “Pasta” contain varying amounts of cocaine and other alkaloids. This process is designed to separate the cocaine from the other alkaloids in the mixture. Coca Paste is added to diluted sulphuric acid and

Table 2 The different steps in refining coca to cocaine base

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- *Coca paste (“pasta”) added to water + diluted sulphuric acid*
 - *Potassium permanganate is added to remove inessential alkaloids through oxidation*
 - *Alkali (ammonium hydroxide) is added to stop the action of permanganate and precipitate the cocaine base*
 - *Filter dry, which eventually results in the Cocaine Base*
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Table 3 The final steps in refining cocaine to street cocaine

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- *Cocaine base dissolved in ether + acetone*
 - *Hydrochloric acid (HCl) is added to precipitate the crystals, filtered and dried, and the result is*
 - *Cocaine Hydrochloride*
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water upon which the alkaloidal “Pasta” will dissolve. Potassium permanganate is added to decompose out inessential alkaloids and other by-products through oxidation (Table 2). This step is critical, and if not done carefully, can result in the destruction of the cocaine as well as the unwanted alkaloids. If this step is omitted, the resultant base is rarely more than 65% pure cocaine. Once oxidation is complete (signalled by color changes), and alkali (ammonia) is added to stop the action of the permanganate after which cocaine base precipitates, then being filtered and dried. This process can be carried out almost anywhere, since there aren’t any leaves to carry around. Often, such “base” labs are found in the jungles of Colombia, and Coca Paste is brought to them from several “Pasta” labs located near growing areas throughout the Andes region.

The third step in refining is to convert the Cocaine base into its salt (Table 3). This final step in manufacturing illicit cocaine is the making of “Crystal”, which is the South American name for cocaine hydrochloride – not to be confused with methamphetamine which is often called “crystal” in the US. The hydrochloride (salt) form of cocaine is the most common form sold in the street. The primary reasons for its use as a salt is the fact that the hydrochloride is soluble in water, so it can be applied to mucous membranes (snorted), or put into solution and injected. In addition, it is also more stable for storage purposes than the base form. The following process can be carried out almost anywhere, often an apartment in Bogota, Colombia, is all that’s required: Cocaine base is dissolved in ether and acetone. Hydrochloric acid (HCl) is added, and this will precipitate crystals of cocaine hydrochloride, which is not soluble in organic solvents like ether. The crystals are filtered off and dried. This product is cocaine hydrochloride or street coke (Fig. 21). As will be seen later, some users are converting their cocaine hydrochloride back into cocaine base, by chemically “freeing” the base from its hydrochloric salt in order to get a product that can be smoked.



Fig. 21 Appearance of “Crystal”, or street coke; this is what the final product is supposed to look like

Trafficking of Cocaine: The Legal Approach

Once the cocaine has been legally produced from the coca leaf, it is exported to various countries for medicinal use, basically as a topical local anesthetic (applied to the surface, not injected, only treating a particular area). In the United States the crystalline powder is imported to pharmaceutical companies who process and package the cocaine for medical use. Merck Pharmaceutical Company and Mallinckrodt Chemical Works distribute cocaine in crystalline form (hydrochloride salt) in dark colored glass bottles to pharmacies and hospitals throughout the United States. Cocaine, in the alkaloid form (base drug containing no additives such as hydrochloride in the crystalline form) is rarely used for medicinal purposes. Cocaine hydrochloride crystals or flakes come in 1/8, 1/4 and 1 oz bottles from the manufacturer and has a wholesale price of approximately \$20-\$25/oz (100% pure).

Cocaine is still a drug of choice among many physicians as a topical local anesthetic because the drug has vasoconstrictive qualities as it stops the flow of blood oozing. And although synthetic local anesthetics such as novacaine and xylocaine (lidocaine) have been discovered and are used extensively as local anesthetics, they do not have the same vasoconstrictive effects as cocaine.

Profit Making and Trafficking of Cocaine: The Illegal Approach

The hierarchy of cocaine traffic is as follows:

1. Cultivation, harvesting and selling of dried coca leaves to clandestine labs at a price from \$1 to \$3/kg.

2. Extraction of cocaine from the dried coca leaves and selling pure cocaine to the wholesaler at a price of \$3,000/kg realizing a profit of approximately \$2,500/kg.
3. Directly selling or smuggling the kilo of pure cocaine to the distributor for a price of \$18,000/kg, realizing a profit of \$15,000/kg.
4. *Cutting* the cocaine and selling it at pound quantities to dealers for \$10,000/lb (50% pure cocaine) realizing a profit of \$22,000 from the original kilo he purchased.
5. *Cutting* the cocaine and selling it at ounce quantities (30–40% pure cocaine) to the pusher for \$800–\$1,200/oz, realizing a profit of \$10,000 from the pound the pusher originally purchased.
6. Possible *cutting* the cocaine and selling it by the gram (spoon) quantities to users for \$50–\$75/g, realizing a profit of \$1,000 from the original ounce the pusher has purchased.

The original 100 kg of dried coca leaf that it takes to produce 1 kg of pure cocaine costs approximately \$200. The kilo of pure cocaine will eventually be worth over \$200,000 when sold to users in 25% pure gram quantities.

The illicitly manufactured cocaine from the various clandestine cocaine labs in South America, is smuggled to various countries including the United States for black market trafficking and use. Those involved in the smuggling of cocaine vary from a one-man operation to organized syndicates. The smuggling methods are unlimited and vary with one's imagination. Often times, cocaine is first smuggled into Mexico rather than directly from South America to the United States. Cocaine, as is heroin, is usually packaged in hermetically sealed plastic bags or rubber condoms for smuggling purposes. Once the cocaine enters the US, it is then distributed through various sub-dealers down to the users. Illicit cocaine, basically, comes in three forms:

1. The hard tiny rock form, which is readily available, especially to the large wholesaler or dealer.
2. The flake form, which is generally fairly pure cocaine, which has been broken down into tiny flakes and considered a delicacy among users of cocaine.
3. The powdered form, which is usually rock or flaked cocaine diluted with other substances such as lactose or procaine.

In the illicit traffic of cocaine, as in many other drugs, there is a definite channel, which the drug goes through from the harvester to the user. Initially, there is the farmer who cultivates, dries and ships the coca leaf to the illicit lab. The clandestine labs then chemically extract 90–100% pure cocaine from the leaf. From the lab, the cocaine is usually sold to smugglers or wholesalers at a price of \$200 an ounce or \$3,000 a kilo. The wholesaler smuggles the cocaine into the United States and sells it to a major cocaine distributor for a certain agreed upon price, which varies and ranges from \$18,000 to \$22,000 a kilo. The distributor will then take the large quantity of cocaine and sell lesser amounts to a number of dealers. He may sell the cocaine in its pure form or dilute it and sell more for a lower price. Most of the traffickers keep in mind that cocaine loses its strength readily and sometimes the cutting or diluting agent will have a tendency after a period of time to begin

destroying the cocaine content. When the dealers are in possession of their 0.5 lb or pound of cocaine, they will most often dilute it with a cutting agent and sell it in ounce quantities to even smaller dealers. The cocaine street pusher will in turn, sell it to the user in gram quantities.

Smuggling of Cocaine

Transportation of refined cocaine to the end-user, apart from private planes and small fisher boats, also commercial airlines are used extensively for smuggling. For example Avianca, the national airline of Colombia was often accused of carrying cocaine. Once, a US carrier (Eastern Airlines) jetliner was confiscated by the US Customs as a warning to stop letting their airplanes be used to ferry cocaine.

Everything has been tried to smuggle cocaine into the Western countries. For instance, envelopes that had been soaked in cocaine in Colombia, were mailed to the US where the cocaine would be recovered. And often so-called “body packers” do the smuggling (Fig. 22). The “body packers” are individuals who swallow cocaine carefully wrapped up in condoms or double latex balloons in order to get through customs. Arrived at their destination, they then pass the packages, taking careful note of their number. This is not always uneventful, and there have been several instances of sudden deaths in the customs inspection area.

To get some idea as to the size and number of “packages” that can be carried the following figure (Fig. 22) shows an X-ray of the abdomen of a subject taken recovering over 90 (!) bags.



Fig. 22 Bags with cocaine salt before being swallowed and an X-ray of a body packer smuggling cocaine

Diluting or “Cutting” of Cocaine

Rarely does anyone, except high echelon dealers, come in contact with pure cocaine. All along the distribution chain the drug is cut or “stepped on”. Adulterants are added to increase weight, and then other, mainly less costly, psychoactive substances are added to make up for lost potency. In the case of cocaine, a typical type of cut is often found: an “anesthetic” cut. This is usually procaine or lidocaine or just about any other synthetic local anesthetic. It really doesn’t matter because the reason is to provide a “freeze” for the user when he either tests the product by dabbing some on the tongue, or snorts it. The resultant “freeze” is usually enough to satisfy the buyer that the coke is of *good quality*. The major problem with cuts is the added toxicity they confer on the primary drug. The greatest toxicity comes from “active” cuts such as phencyclidine (PCP), amphetamines or, what is frequently seen, phenylpropanolamine. Commonly found in cold medications and over-the-counter (OTC) diet capsules, phenylpropanolamine can augment the cardiovascular effects of cocaine, and its effect lasts longer. Another “active” cut is yohimbine, a central alpha-2 blocker with effects opposite to clonidine, which is an alpha-2 agonist. The former drug causes increases in blood pressure and heart rate as well as increased motor activity. It is abused as a general stimulant, and has been illicitly marketed as an aphrodisiac. The diluting agents for the cutting of cocaine are very similar to those used for heroin. One of the basic differences between “stepping on” (diluting) cocaine as compared to heroin, is that cocaine is usually only diluted down from 20% to 40%. The process for cutting cocaine varies from individual to individual. Often times the large dealer use a more elaborate process, but the basic operation is the same throughout cocaine traffic. The cutting or diluting agent used for cocaine again varies with the individual and the substance that is readily available to that individual. Some of the common cutting agents for cocaine are see in Table 4.

Table 4 Summary of cocaine adulterants, so called “cuts”, when it comes to sell cocaine on the streets

Inert drugs	Psychoactive drugs	Local anesthetics
Mannitol	Amphetamine	Lidocaine
Lactulose	Methamphetamine	Procaine
Sucrose	Phenylpropanolamine	Benzocaine
Maltose	Phencyclidine	Tetracaine
Inositol	Quinine	Bupivacaine
Flour	Yohimbine	
Corn starch	Caffeine	Meaverine
Talcum powder	Guarana	Mepivacaine
Ascorbic acid	Strychnine	Articaine
Citric acid		Prilocaine
Plaster	Colchicine	Ropivacaine
Sodium bicarbonate	Acetaminophene	
Sodium borate (Borax)	Ketamine	
Sodium chloride		

Procaine and other local anesthetics present synthetic preparations in powder form, while *Mannite* or *Mannitol* is a sugar substance used as a laxative and produced in Italy. *Menita* is a milk sugar from Mexico and South America, and *Lactose* or *Dextrose* present white powdered milk sugar used as a baby food supplement, which can be purchased readily in any drug store.

Another more active cut is powdered *methamphetamine* also known as “speed”, while *quinine* is used to treat leg cramps and malaria. Many times powder *vitamins* purchased in health food stores and just about any soluble powder that is not disruptive to the body is used. Some typical examples are *baking soda*, *powdered sugar*, *powdered milk*, *starch*, or the laxative *Epsom salts*, a chemical compound containing magnesium sulfate, often encountered as the heptahydrate. The dealer will either be told the percentage of cocaine by a trusted “connection” or he will be able to approximate the percentage by various means.

Ascertaining the Purity of Cocaine and the Cutting Agent

There are several ways how to ascertain the quality of the merchandise

1. **Quantitative chemical analysis**, which is an elaborate process requiring a qualified chemist and special laboratory equipment.
2. **Cocaine drug testing kits** either manufactured for law enforcement purposes or produced by the underground. These testing kits are simply presumptive color tests. The basic color test used for cocaine is *cobalt thiocyanate*. The cocaine or any of the other substances from the “caine” family will form a brilliant blue flaky precipitate with cobalt thiocyanate. This is an indication that the product is cocaine, procaine, tetracaine, etc. In order to determine whether there is actually any cocaine and not all procaine, *stannous chloride* is added to the precipitate causing all of the caines except cocaine to dissolve. If the dealer suspects that cocaine has been cut with a local anesthetic, he can then make a partial determination as to how much of the procaine or another “caine” is contained in the total powder by a more selective test.
3. **The chlorox test**. Chlorox is a brand bleach consisting of a 5.25% solution of sodium hypochlorite and is typically used as a household bleach. It is alleged that the dealer can take suspected cocaine and drop it in a vial of chlorox. While the cocaine will dissolve completely, procaine (or any other local anesthetic) will turn a reddish orange color with trailing to the bottom of the vial as residue. Although the test is very unspecific, it still is used by many dealers.
4. **The water test**. It is also alleged by the street dealers, that a determination can be made as to how much cut is in the cocaine by placing the powdered substance in a glass of water. Although not very meaningful, allegedly cocaine will dissolve almost immediately leaving the remaining cut which normally will dissolve slower and not as clear.

5. **The burning test.** The powdered cocaine is placed on aluminum foil and held over a low flame or match. The cocaine will burn clear. A sugar cut will darken and burn a dark brown or black therefore the larger the cut, the darker the burn. Crystallized speed or methamphetamine will pop when burned. Salts do not burn and remain as residue (cuts such as procaine or quinine also burn fairly pure although it is alleged that procaine can be detected by a bubbling of the substance before it burns clear).
6. **The methanol test.** Most common cuts do not dissolve in pure methanol although cocaine does. Unfortunately for the dealer, procaine and methamphetamine also dissolve in pure methanol. It is imperative that pure methanol be used since any water in the alcohol will tend to dissolve other cuts such as sugar and salt. Methanol can be obtained in most paint supply stores. The dealer will take two equal amounts of the cocaine substance and place the equal amounts in two teaspoons next to one another. Then a quarter of a teaspoon of pure methanol is added to one of the spoons. The mixture is then stirred and any powder that remains is compared to the original unaltered amount in the second teaspoon to determine the percentage of the cut. If, for example, 20% of the original amount did not dissolve, the substance tested would be no more than 80% pure.
7. **The sodium carbonate test.** If the suspected cut is procaine, the cocaine substance can be added to a sodium carbonate solution. This would dissolve all the cocaine leaving just the procaine.
8. **The use test.** Some dealers will test the percentage of cocaine by snorting (Fig. 23). This is probably the best and most common street test in determining the purity of the cocaine. The tester should standardize the amount snorted so that he will have the ability to distinguish. The tester will look for the swiftness of the high and the “freeze” or numbness the substance causes. If the nasal passages



Fig. 23 Snorting of cocaine, a common practice for testing of cocaine quality but also a method of abuse

burn and the eyes tear, there is a good possibility the cocaine has been cut with speed. Sugar and salt cuts quite often cause a post nasal drip. Excessive sweating and hyperactivity could mean either a speed or quinine cut was used. Excessive diarrhea would denote a laxative type cut such as epsom salts, or menita. Speed tends to cause irregular bowel movement. A greater degree of numbness indicates the presence of procaine or other local anesthetics.

9. **The taste test.** Cocaine has a bitter taste and the added cut will tend to alter that taste. A milk sugar cut will sweeten the cocaine although dextrose has a tendency to sweeten the substance more than lactose. Procaine will be bitter to the taste but will tend to numb the gums and tongue quicker and longer than cocaine. Sodium chloride has an after taste and Epsom salts are bitter in taste and sandy in texture.
10. **The observation test.** Pure cocaine crystals have a shiny almost transparent appearance and even when crushed, will retain the crystalline sparkle. The crystalline sparkle of cocaine will be dulled by most cuts. Dextrose has less dulling effect than lactose although a speed cut usually dulls the crystals less than most other cuts. Although salts have a crystalline structure, they tend to be duller than the cocaine crystals. An alleged indication of the purity of the cocaine is also the tiny rock-like material contained within a probe. The tiny rocks are most likely pure cocaine as they come from the manufacturer. The rock or hard substance can be ascertained by feeling the powdered substance.

Once the dealer has assured the purity of the cocaine and/or the cut or adulterating agent, he is then ready to begin the process of “stepping on” the cocaine. Most dealers will dilute a small portion of the cocaine and then re-test it. Many dealers claim that they usually only cut the amount of cocaine that will immediately be sold because the cuts have a tendency to destroy the stability of cocaine. It is therefore advantageous for the dealer to keep the cocaine sealed in a cool place such as the refrigerator and in an amber or dark-colored jar to retain the strength of the drug as long as possible. Dealers claim that with time, moisture, warmth, air and sunlight decrease the potency of the cocaine.

The process for “*stepping on coke*” again varies with individuals, but the two basic formulas are similar to those of heroin and are as follows:

- 1 oz of lactose added to 1 oz of 100% cocaine = 2 oz of 50% cocaine
- 2 oz of lactose added to 2 oz of 50% cocaine = 4 oz of 25% cocaine
- 2 oz of lactose added to 1 oz of 100% cocaine = 3 oz of 33.3% cocaine
- 3 oz of lactose added to 1 oz of 100% cocaine = 4 oz of 25% cocaine
- 4 oz of lactose added to 1 oz of 100% cocaine = 5 oz 20% cocaine

The dealer will measure off the desired amount of cocaine, for instance five level teaspoons, and place it in a pile on a flat nonporous surface such as a record album, mirror or glass plate. He will then measure off the desired amount of lactose and place it in a separate pile on the same surface. Then, using a playing card, razor blade, knife or any sharp edged instrument, the dealer chops the cocaine to take out all lumps so the cocaine is a fairly fine powder. In order to separate any foreign

material, the mixture is then sifted through a sifter or nylon stocking so that a fine fluffed powder is obtained. Once through the sifter, the cocaine usually has a little more volume since it has been fluffed. The cocaine is then sifted into a pile and the same process is repeated with the diluting agent. Thereafter, the dealer will mix the pile of cocaine into the pile of diluting agent. Once this has been accomplished, he sifts the diluted cocaine through a sifter trying to get the mixture as equal as possible. At times the dealer will resift the diluted cocaine to assure an equally distributed mixture, which then is ready to be placed into packages for sale. Once the dealer has diluted the cocaine, he will measure off the desired amount to be packaged by weighing it on scales.

Economics of Cocaine

This is a rather simplified attempt to trace a 100 kg (220 lb) shipment of cocaine from the growers to the users (Fig. 24). At this point it might be useful to say a few words about the organization of the business. The major traffickers are thought to

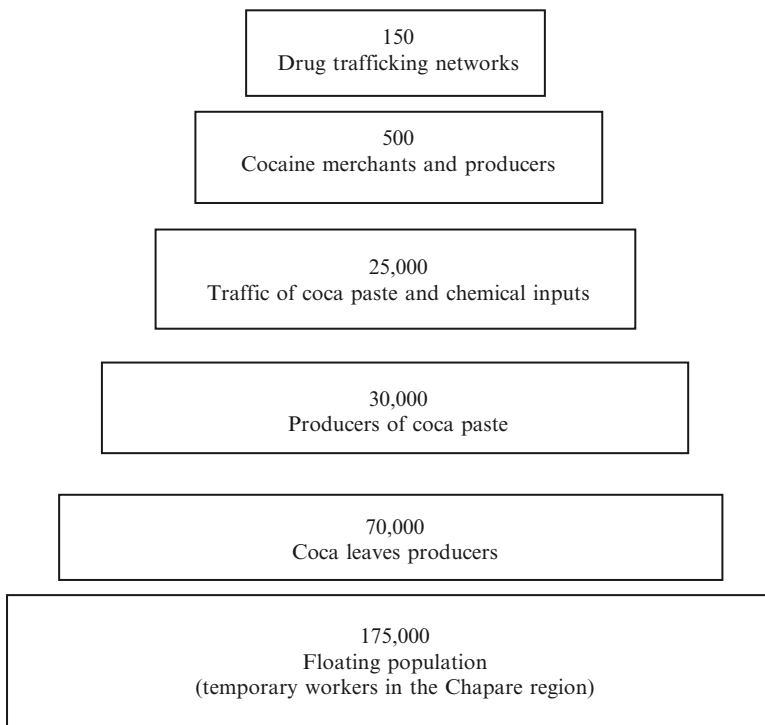


Fig. 24 Representative example of the economics of cocaine in Bolivia of a population employed in coca and cocaine production

be a collection of 12 South American families, who control the cocaine trade at every level, from grower to consumer (vertical integration). The chart shows the number of people involved at various levels. Note that the one point, where everything comes down to a single person, is at the level of the smuggler (“mule”), and it’s no wonder that interdiction efforts are concentrated at this point.

The estimate of monetary value is based on 1 g of street coke, purity around 30%, and costing the user US\$100. Naturally, prices fluctuate, especially at the present writing, when there is a glut of cocaine on the market and prices are falling, but there’s still a big “sucker” trade out there, and not all users are getting high quality cocaine at US\$65/g. The current estimate of the size of the illicit market is US\$80 billion/year for all drugs.