TECHNOLOGY TRANSFER GROUPS AND THEIR IMPACT ON TECHNOLOGY INNOVATION IN THE SUGAR AGROINDUSTRY IN THE CAUCA VALLEY, COLOMBIA

By

C.H. ISAACS, S.V. CASTILLO, V.E. CARRILLO,
L.A. MOSQUERA and A. FRANCO
CENICAÑA, Cali, Colombia
chisaacs@cenicana.org

KEYWORDS: Technology Transfer Groups, Colombian Sugar Agro-Industry, Technology Innovation, Characterisation of Productive Units, Dynamic Monitoring.

Abstract

THE PURPOSE of this study was to measure the impact of the technology transfer strategy of forming groups of cane producers known as Technology Transfer Groups (GTT – Spanish acronym) in the process of technological innovation in the sugarcane agro-industry in the Cauca Valley, Colombia. The GTTs prioritised their needs for technical information and then implemented a program for outreach and exchange of the best cultural practices based on various group communication methods. Two years after the program started, a dynamic process of monitoring technological innovation in the production units began; and the changes in the process of technology adoption were characterised over time, focusing on the factors that were most influential in the process. The monitoring, which was done with a representative sample of cane producers, found that the greater exchange of best practices among them led to their faster adoption and increased levels of technology adoption (cane varieties and agronomic practices), as well as the productivity of their production units. In addition, it created a culture of agricultural practices based on site-specific agriculture and strengthened the interactions, communication and integration among the producers, sugar mill professionals and researchers. The greater adoption of technology, product of CENICAÑA's research, has led to a dynamic process of technological innovation in the sugar agro-industry as the new agricultural practices generate higher returns for the producers, sustainability and competitiveness.

Introduction

CENICAÑA is a private, non-profit corporation, founded in 1977 by the Association of Sugarcane Growers of Colombia (ASOCAÑA). Its mission is to contribute to the development of the national sugar sector by means of research, technology transfer and the supply of specialised services so that the sector is competitive and can play an outstanding role in socioeconomic improvement and in the conservation of a productive, pleasant and healthy environment in the sugarcane production zones.

In 1995, the principles of social marketing were gradually incorporated into the CENICAÑA research and technology transfer system, given the low rate of adoption of the new technologies by the sugarcane productive units, particularly in the Cauca River Valley.

The project 'Study of the clients for CENICAÑA's new technology' was begun. A census was taken of the cane producers and their productive units, which served as a basis for breaking down the clients for the technologies in order to design transfer and technical communication strategies. Two groups were identified according to their level of technology adoption with five subgroups ordered by level of schooling and crop ownership (Isaacs *et al.*, 2000). Then a

behavioural characterisation of the potential adopters was prepared, based on personal characteristics (psychological, sociological and socioeconomic) that were expected to influence the process of technology innovation (M.J. Marrón in Puyol *et al.*, 1995; Isaacs *et al.*, 2002).

In 2001, together with the publication of the third approximation of the agro-ecological zoning for growing sugarcane in the Cauca River Valley (Carbonell *et al.*, 2001), CENICAÑA strengthened its site-specific agriculture (SSA) initiative.

This initiative focuses on adapting and applying research and technology transfer of specific agricultural technologies to specific crop sites with unique soil and climate characteristics, and physical and socioeconomic infrastructure.

Its objective is to optimise the levels of productivity and profitability within the framework of sustainable development.

To disseminate SSA and promote the use of improved cultural practices from the technical, economic, environmental and quality control standpoint, among others, the project 'Technology transfer groups (GTTs)' was designed to link the cane suppliers of 11 sugar mills from 2001–2006 (Isaacs and Uribe, 2002; CENICAÑA, 2009a).

The strategic methodology applied successfully by the National Institute of Agricultural and Livestock Research (INIA, Chile) and by the Regional Consortia of Agricultural Experimentation (CREA, Argentina) (Isaacs, 1999; CREA, 2009; INIA, 2009) was adapted.

At the 455 events (293 field days, 104 conferences, 53 workshop-courses and five technical study tours) that the GTT program held during this time, 112 innovative cane growers presented their experiences related to technological management in their productive units. These have been documented and can be consulted on www.cenicana.org.

The objective of this study was to evaluate the influence of the GTT program on the process of technology innovation of the Colombian sugar agro-industry during the period 2001–2008.

Materials and methods

The GTT program has five components:

Formation of groups and characterisation of the productive units

In each sugar mill, groups were formed with a maximum of 25 cane suppliers with productive units of similar agro-ecological characteristics. (CENICAÑA, 2008).

A workshop was held with each group to characterise the technologies used in their productive units prior to the GTT program and characterise them using reference indicators to evaluate their management of technology transfer.

The producers filled out a formal survey on technology adoption, socioeconomic characteristics and the physical infrastructure of the productive units under their charge (CENICAÑA, 2009b)

The groups included three different types of producers: PV-1: suppliers with limited innovation and low productivity; PV-2: intermediate in innovation and productivity; and PV-3: the most innovative and with high productivity (Table 1 and Figure 1).

In Figure 1, each isoline represents points of equal productivity in tonnes of sugar per hectare; it means the combination of tonnes of cane per hectare per sugar content (%). All in all, 23 GTTs were formed with 900 suppliers.

Identification of priorities regarding the groups' needs for technical information

In participatory workshops with each GTT, the needs for the groups' technical information were prioritised by CENICAÑA using a Vester Matrix based on the technological problems that the producers perceived as production constraints (Table 2).

A program of transfer events was prepared, using the communication media preferred by the producers for obtaining technical information: primarily field days and roundtable discussions.

Table 1—Application of Marrón's model explaining innovative behaviour (In: Puyol *et al*., 1995, p. 339) with producers in Groups PV-1, PV-2 and PV-3 in relation to the adoption of new technologies.

Variables which characterise an innovating conduct	Grower type		
	PV-1	**PV-2**	**PV-3**
Variables inherent in the innovation			
Economic yield	Yes	Yes	Yes
Compatibility with previous crop	Yes	Yes	Yes
Easy to farm	Yes	Yes	Yes
Possibility of prior experimentation	Yes	Yes	Yes
Immediate comparison of yield	Yes	Yes	Yes
Variables relative to personal characteristics of potential adopters			
• **Socioeconomic**			
Schooling	24% primary 76% secondary	100% professional	82% professional
Social status	Middle-low	Middle-high	Middle-high
Size of operation	Low Average 53 ha	Middle Average 88 ha	Middle-high Average 103 ha
Operations under producer-supplier regime	Yes	Yes	Yes
• **Psychological**			
Decision-making autonomy	Yes	Yes	Yes + agility
Fatalism	Median presence	Median presence	Absence
Profit oriented	Yes	Yes	Yes
Openness to change	Low	Middle	High
Risk avoidance	High	Middle	Low
Traditionalist, enterprising, innovator	Traditionalist	Enterprising	Innovator
• **Sociological**			
Family situation	Apparently without difficulties	Apparently without difficulties	Apparently without difficulties
Age	From 41 to 60 years old	From 31 to 50 years old	Form 41 to 60 years old
• **Farmers' social behaviour**			
Localism, cosmopolitism	Localism	Cosmopolitism	Cosmopolitism
Social participation	Not affiliated to associations	Affiliated to Procaña[1]	Affiliated to Asocaña[2] and Tecnicaña[3]
Exposure to communication channels	Low-middle	Middle-high	High
Structural variables			
Land adjustments	Middle	Middle-high	High
Water availability	Acceptable	Acceptable	Abundant
Community	Conservative	Receptive	Receptive
Development economic	Low to middle	Middle-high	High

1. Procaña: Colombian Association of Sugarcane Producers and Suppliers
2. Asocaña: Association of Sugarcane Growers of Colombia
3. Tecnicaña: Colombian Association of Sugarcane Technician

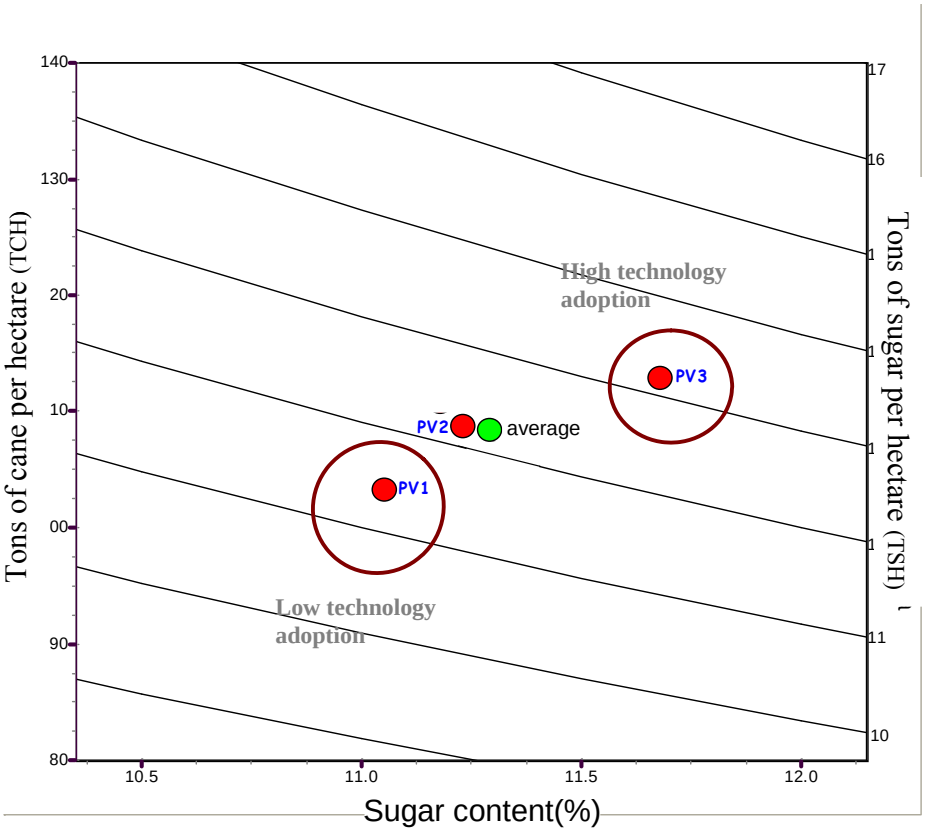

Fig. 1—Crop production isolines for sugarcane producers and agro-ecologicalzone 11H3 (2004–2008).

Table 2—Prioritisation of producers' needs for technical information on sugarcane in the Cauca Valley. GTT at the Manuelita Sugar Mill.

Problem No.	1	2	3	4	5	6	7	8	9	10	Points	Priority
1		1	1	1	1	1	1	1	1	1	9	1
2			2	2	2	2	2	2	2	2	8	2
3				3	3	3	3	3	3	3	7	3
4					5	6	7	8	9	10	0	10
5						6	7	5	5	10	3	7
6							6	6	6	6	6	4
7								8	7	10	3	6
8									8	10	2	8
9										10	1	9
10											5	5

1. Waste management (Priority 1)
2. Water management (Priority 2)
3. Soil compaction (Priority 3)
4. Harvest
5. Ripeners
6. Varieties
7. Energy alternatives for well management
8. Soil management and cultural practices
9. Farm administration
10. Training of field staff

Program of events and their implementation

The field days, as the principal medium of group communication, were preferably held on the farm of the producer identified by the group as being the most innovative and progressive in the

technical topic to be addressed. The program usually included three presentations: (1) The host producer presented the best practices for the topic in question and the results obtained; (2) The technical expert of the sugar mill explained the best practices implemented by the sugar mill; (3) The expert researcher from CENICAÑA discussed the progress made in the related research, with emphasis on the practical results for the producer. Each presentation addressed the technical aspects (application and use of technology), economic factors (profitability of new vs. conventional technologies), environmental aspects (sustainability), and quality control (correct utilisation of the technology). Finally a roundtable discussion was organised to share experiences, define needs for technological R&D, and identify technologies that should be validated under the production conditions in the GTTs' agro-ecological zones of influence. The producers' observations, requests, suggestions and recommendations to CENICAÑA were recorded for feedback into the processes of research, technology transfer and the GTT program (Table 3).

Table 3—Example of the needs expressed by the GTT with the purpose of supporting technological management and innovation in the sugarcane productive units.

TOPIC	Needs
Water management	Training of estate administrators and irrigation workers
	Information on energy sources for operating deep wells
	Development of Water Balance software (update)
	Information on pulse, trickle and pivot irrigation; fertigation
Varieties and nurseries	New varieties according to agro-ecological zone
	Information on technological packages by variety
	Indicators for varieties with mechanised harvest
	Economic information on varieties
Varieties and nurseries	New varieties according to agro-ecological zone
	Information on fertilisation in green cane harvesting
	Information on uses of chlorophyll meter and its practical utility

The proceedings of each event are published in CENICAÑA's extranet for reference by registered users, who can also access the SSA information tools on line and consult structured databases that are regularly updated and designed to support the technical, economic and administrative decision-making in the productive units. The Web system also offers access to the library's catalogues and publications, as well as to the bank of frequently asked questions and technological consultations, whereby the producer has the chance to interact with researchers and consult them about technical issues.

Dynamic monitoring

In order to measure the progress made in managing technology adoption, a process of systematic and participatory monitoring was carried out: first at two years after having begun the GTT program in each sugar mill and then at five years.

In this way, the progress in the adoption of the technologies in the short term was measured, and in the medium term the changes in the indicators of productivity and profitability of the productive units were evaluated, after which the impact of the communication strategy was determined. From 2001–2006, a total of 11 sugar mills were connected with the GTT program: Risaralda in 2001; Manuelita and Providencia in 2002; Castilla, Incauca, Mayagüez and Pichichí in 2003; Riopaila and Sancarlos in 2004; Cabaña and Carmelita in 2006. The monitoring analyses were done for the first eight mills.

The information was obtained by means of semi-structured interviews conducted by expert agronomists with a representative sample of the producer population, designed using simple random

sampling. The interviews were held in the productive units, using a guide for recording the current use of technology. The data were then recorded in a database created in Microsoft Excel©. The following analyses were performed:

- *Descriptive analyses* to synthesise the information and characterise the current use of the technologies through graphics, frequency distribution tables, indicators of central tendency and indicators of dispersion. The results obtained were broken down by producer; i.e. the cane provider or administrator of productive units with direct management of a sugar mill.
- *Multivariate analyses* for identifying possible associations between the characteristics of the adopters and non-adopters of the water balance methodology for programming crop irrigation schedules in the productive units.

These analyses were done with the SAS© statistical software v.9.1.3. They comprised:

- Multiple correspondence analysis in which the characteristics of the producers were associated on a Cartesian plane
- Analysis of conglomerates in which the characteristics of the associated producers were grouped in the multiple correspondence analysis, and segments of producers with similar characteristics and behaviours were created.

The results for each sugar mill were documented and then analysed with each GTT. For an example, consult Pino (2007).

Results and discussion

Examples are given of the results of the monitoring done in the productive units of cane suppliers participating in the GTT program in relation to the adoption of technologies such as cane varieties, SSA, water management, fertilisation and planting.

Adoption of technology such as cane varieties

In 2008, CENICAÑA varieties Colombia (CC) occupied 88% of the area planted with sugarcane in the Cauca River Valley, an increase of 40% with respect to 2001. In 2008, the most planted varieties were CC 85-92 (69%) and CC 84-75 (14%). Other new varieties in commercial validation trials have occupied 5% of the area since 2001 (Figures 2 and 3).

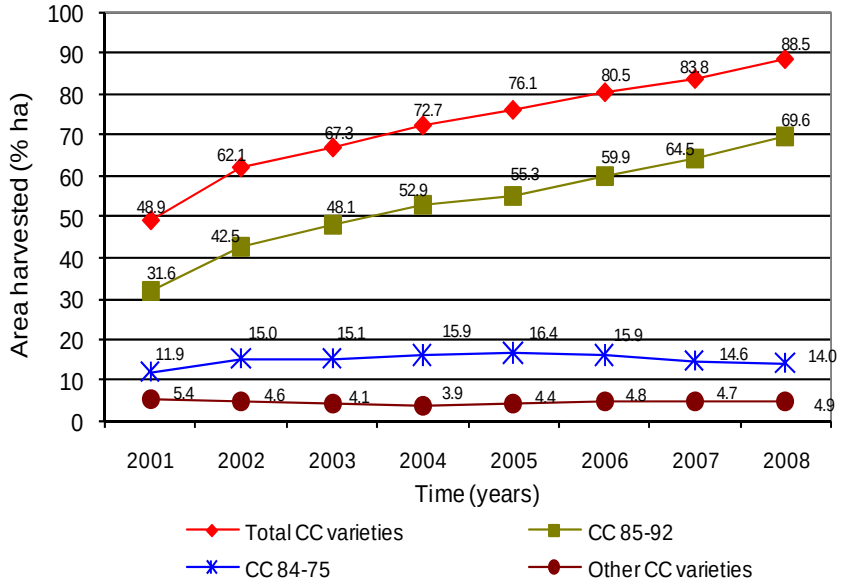

Fig. 2—CENICAÑA Colombia (CC) varieties in the Colombian sugar agro-industry from 2001–2006: Adoption of commercial varieties.

With respect to varietal adoption, the producers in the GTTs said that they decided to adopt a variety when it has:

- a high operating margin;
- sustainale production;
- productivity over 10 tonnes of cane per hectare per month (TCHM – Spanish acronym);
- production 10% higher with respect to the currently planted variety;
- results of commercial testing of 250 ha or more at their specific sugar mill.

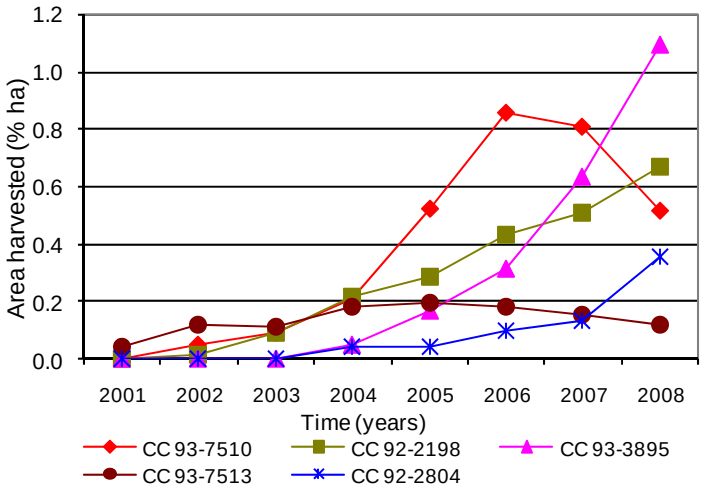

Fig. 3—CENICAÑA Colombia (CC) varieties in the Colombian sugar agro-industry from 2001–2006: Semicommercial testing of varieties.

Adoption of the SSA approach for taking decisions about agronomic management

With the dissemination of the SSA approach, the number of cane suppliers that use the agro-ecological zoning developed by CENICAÑA to decide which cultural practices to use has increased by 51%; the cane suppliers that use it to decide which variety to plant has grown by 37%; and those who can identify the agro-ecological zones of influence in their productive units has increased by 15%. A total increment between sugar mills and cane suppliers of 33%, 21% and 8% to each technology.(Figure 4).

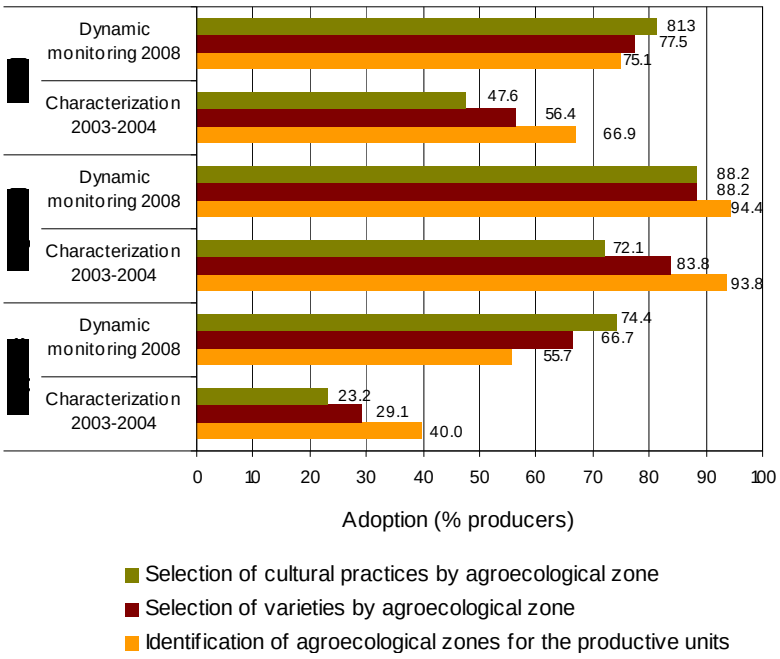

Fig 4—Adoption of the site-specific agriculture (SSA) approach for decision-making in the sugarcane crop by cane suppliers and sugar mills.

Adoption of agronomic management technologies with the SSA concept

The principal changes in the adoption of technology by the productive units of suppliers are summarised in Table 4. Some of them are commented on below.

Table 4—Changes in the adoption of technologies in the sugarcane production systems in the Cauca River Valley. Percent cane suppliers (GTTs per sugar mill) who confirmed their use of the technologies.

Technology	Changes in technology adoption based on percentage of cane suppliers that use them								
	Providencia			Mayagüez		Pichichí		Castilla	
	2002	2004	2006	2003	2007	2003	2007	2003	2008
Water management (irrigation and drainage)									
Water balance	6	15	15	7	17	7	18	7	19
Alternate ridge irrigation	31	61	56	11	58	37	67	48	53
Gated PVC pipes	14	45	70	12	46	32	49	10	25
Surface drainage	–	–	37	51	59	63	90	43	76
Fertilisation									
Soil analyses	96	100	87	63	100	68	89	77	84
Cenicaña's Chemistry Lab	4	12	9	10	0	3	12	48	52
Critical levels determined by CENICAÑA	15	15	8	22	0	6	8	40	33
Nitrogen: one application (no split applications)	17	40	41	57	58	26	56	49	60
Planting density									
Distance of 1.65 m between furrows	3	73	44	4	24	–	35	3	9
Distance of 1.75 m between furrows	3	13	37	12	65	4	29	4	18
Distance of flag markers >=12 m (planting)	–	–	28	42	54	7	11	28	32

Table 4 cont.

Technology	Changes in technology adoption based on percentage of cane suppliers that use them								
	Riopaila		Incauca		Risaralda			Manuelita	
	2004	2008	2003	2008	2001	2003	2008	2002	2008
Water management (irrigation and drainage)									
Water balance	8	16	7	20	3	8	21	30	29
Alternate ridge irrigation	30	55	35	51	2	2	35	52	37
Gated PVC pipes	15	35	8	19	13	12	11	26	29
Surface drainage	68	89	43	88	33	50	76	–	68
Fertilisation									
Soil analyses	74	84	58	73	72	91	96	70	72
CENICAÑA's Chemistry Lab	18	15	18	45	39	50	87	22	31
Critical levels determined by CENICAÑA	48	16	20	18	20	75	33	25	8
Nitrogen: one application (no split applications)	55	71	21	33	17	17	12	–	64
Planting density									
Distance of 1.65 m between furrows	10	26	7	27	2	30	76	22	67
Distance of 1.75 m between furrows	25	16	2	8	0	31	6	39	9
Distance of flag markers >=12 m (planting)	32	10	22	27	14	20	35	–	24

Water management

The monitoring of the irrigation methods used by the cane suppliers shows that the irrigation events are characterised by continuous furrow and alternate ridge applications with irrigation channels and siphon tubes, followed by continuous furrow applications and the use of gated PVC pipes, alternate ridge applications and gated PVC pipes, and finally sprinkler irrigation.

Water balance

The descriptive analysis indicates increases in the level of adoption of the water balance methodology for programming the irrigation for both the alternate ridge applications and the use of gated PVC pipes, as well as in infrastructure for surface drainage. The principal reasons for the change are related to the benefits obtained with the use of water balance software (Cenicaña© WB v.3.0), reflected in a decrease in the number of irrigations (from 1–3 fewer irrigations per cut), the reduction in production costs, and better organisation of the productive unit. Those who are not using the WB program said that they were unfamiliar with its management.

The first two dimensions of the multiple correspondence analysis explained 92.1% of the total variability; the first dimension (Dim1) explained 82.8% and the second dimension (Dim2) explained 9.3% of the variability.

Dim1 is determined by the adoption or not of the water balance program so that low values of this dimension are associated with producers who do not adopt the program and high values with producers who adopt it. This dimension also presents a direct association with the education level and with the productive unit size; low values of Dim1 are associated with low or medium education level and areas of productive units ≤ 500 hectares. High values of Dim1 are associated with high education level and areas of productive units > 500 hectares. Besides, producers with age ≤ 45 years are associated with high values of Dim1, and producers with age > 46 years with low values.

Given the poor explanation of the variability for Dim2, it is not easy to interpret. Nevertheless, it was considered in the conglomerate analysis.

The statistical technique of conglomerate analysis uses software SAS 9.1 identified the possible associations between the adoption of the water balance methodology and the following variables: utilisation of the WB v.3.0, the producer's age and schooling; schooling of the field supervisor, net area in cane group, source of the data on rapidly available water (LARA – Spanish acronym), source of information about the WB program, training in the WB program, owning a computer, owning the land and type of legal status. These analyses included information on cane suppliers and professionals from the sugar mills.

Four groups of producers were formed with similar characteristics, and a behaviour based on the adoption of the water balance methodology and the cause-effect relation of the adoption was determined (Figure 5).

Producers with aversion to technological change (Group 1): Characterised by having primary or secondary education (*Pprim, Psecu*), over 55 years of age, productive units under 50 ha, field supervisor with primary education (*Mprim*), do not own a computer (*Noc*), have not been trained in the use of the WB software and did not acquire the WB program (*Nocp, Not*).

Producers no adopters (Group 2): Characterised by having a technical education (*Ptec*), ages from 46–55 years, productive units with areas from 51–500 ha, do not use the WB program (*Nobh*), have not determined the LARA data (*Nd*), and all of them are cane suppliers (*Prov*).

Producers with a potential for adoption (Group 3): Characterised by being under 35 years of age, with a professional education (*Pprof*), manage from 501–1000 ha, trained in the use of the WB program (*Sicp*), field supervisor with secondary and professional education (*Msecu, Mprof*), and own a computer (*Sic*).

Producers adopters (Group 4): Characterised by administering areas over 100 ha, ages from 36–45 years, graduate education (*Ppost*), obtained the LARA data from a specific study of the farm

(*Ef*), of CENICAÑA's table (*TCc*) or from the sugar mill (*Ing*)), have field supervisor with technical education (*Mtec*), productive units directly managed by the sugar mill (*mdi*), and use the WB program (*Sibh*).

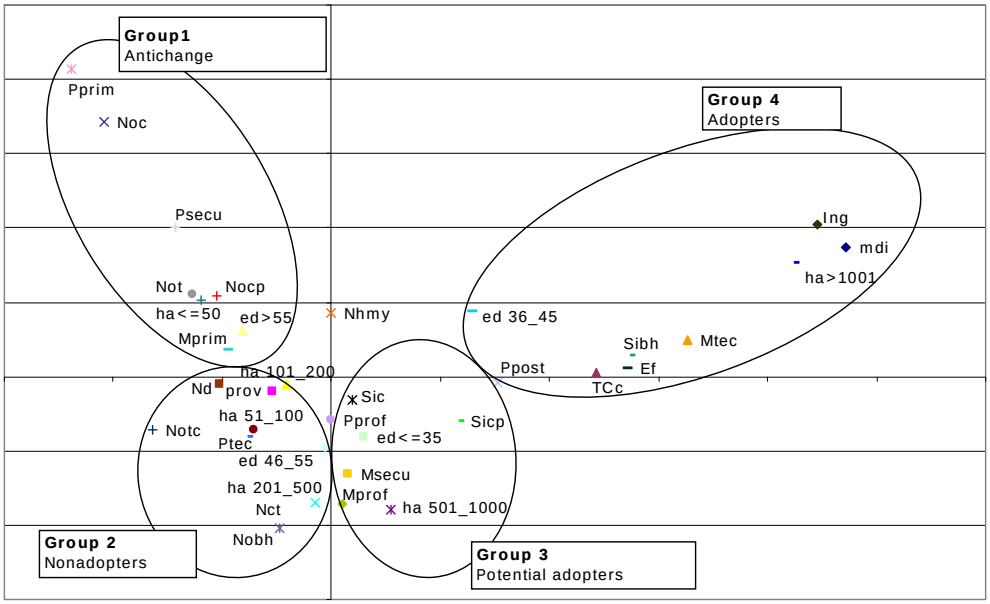

Fig. 5—Conglomerate analysis based on adoption of the water balance methodology in the GTT productive units.

Alternate ridges

Among the main reasons for using alternate ridge irrigation, the producers mention the limited availability of water, decreased production costs, and optimised use of the water resource.

Fertilisation

The use of soil analyses to define the plan for fertilising the crop increased, as well as sending the samples to CENICAÑA's Chemistry Lab for that purpose. Despite those increases, there was a noteworthy decrease in the number of suppliers that use the critical levels of NPK determined in the research carried out by CENICAÑA. The most frequent reason for this was that they do not use CENICAÑA's lab service and therefore do not receive the recommendations that are given together with the results of the analysis.

The level of adoption of nitrogen fertilisation (just one application, not split) increased in the GTTs at some sugar mills; while in others there were no important changes. Those who split the nitrogen application explained that the main reason for doing so was the type of soil that they manage (sandy) and also because it is a traditional practice. On the other hand, those who applied nitrogen just once stated that by not splitting it, they also decreased their production costs. They also have knowledge of the positive results that have been obtained in commercial validation trials.

Planting

With respect to planting distances, there was a growing tendency for the percentage of suppliers who made the decision to use a distance greater than 12 m. The reasons include decreased production costs due to the use of less seed and the credibility of the experimental results. Those who use planting distances less than 12 m expressed their fear of having to replant and the subsequent increase in production costs.

Regarding the distance between furrows, there was no well-defined tendency of change. The most frequently used distances are 1.65 m and 1.75 m. The reasons indicate that with these distances the crop is favoured during the harvest because there is less damage to the stools from the machinery. Those who used smaller distances between furrows were afraid that the production would decline.

Use of the Web site

CENICAÑA's Web site plays an active role in its technology transfer process. It offers the cane producers information and documentation services, as well as interactive consulting tools to support crop-related decision-making. Since it was launched in November 2003, the number of users registered on the Web site has increased progressively, as well as the number of users that consult the proceedings of the GTT program based on the statistics recorded by the AWStats© software (Figures 6 and 7).

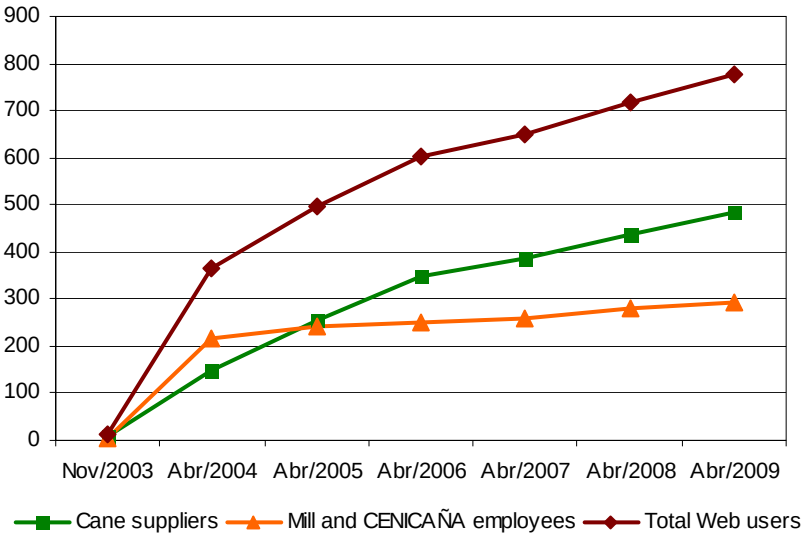

Fig. 6—Number of users registered on <www.cenicana.org> from November 2003 to April 2009.

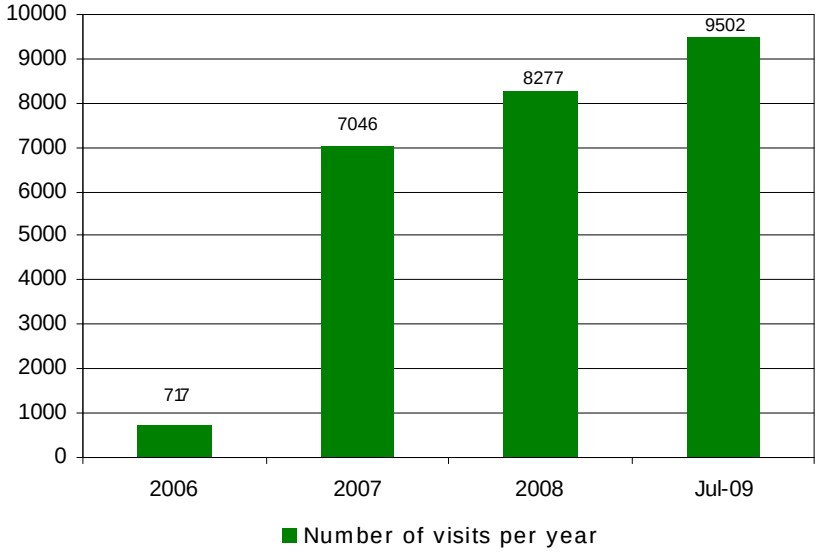

Fig. 7—Number of visits by users with a code to enter the pages containing the proceedings from GTT events on www.cenicana.org.

Technology innovation, productivity and profitability

In 2007, CENICAÑA contracted the Foundation for Higher Education and Development (FEDESARROLLO) to conduct an evaluation in order to learn what was the economic return on its investment in research and technology development. It was estimated that the additional net benefits coming from the use of varieties CC 85-92 and CC 84-75 reach US$46 million per year as compared with the use of the other varieties (CENICAÑA, 2008).

In experiments to validate the technology with the cane producers' participation, it was found that the use of reduced practices such as reduced tillage, fewer risks in accordance with water balance, lower plant density (seed) and minimum dose of fertiliser according to soil analysis, among others and practices with an SSA focus were good strategies for reducing production costs and increasing the levels of profitability vis-à-vis the conventional practices (Isaacs et al., 2009a, 2009b).

With respect to reducing production costs, the technologies for water management stand out, the use of which have contributed to decreasing up to 50% of the volume of water applied per unit of area.

Conclusions

- The GTT program has proven to be an effective strategy for group communication with the sugarcane producers and has promoted technology innovation in the productive units planted with sugarcane in the Cauca River Valley.
- The GTTs have strengthened the relations and communication among producers, researchers and field professionals from the sugar mills, facilitating the exchange of information on the best cultural practices.
- The exchange of information that is promoted in the GTTs has contributed to strengthening the knowledge of the sugarcane producers with emphasis on SSA applied to crop management.
- The increased levels of adoption of the new technologies promoted by CENICAÑA have impacted on both the productivity and the profitability of the cane productive units.
- The GTTs have been an effective mechanism for providing feedback to CENICAÑA about the needs that the sugarcane producers in the Cauca River Valley have for technological R&D.

REFERENCES

Carbonell G., J., Amaya E., A., Ortiz U., B.V., Torres A., J.S., Quintero D., R. and Isaacs E., C.H. (2001). Zonificación agroecológica para el cultivo de la caña de azúcar en el valle del río Cauca. Tercera aproximación. CENICAÑA, Cali, Colombia. 59 p. (Serie Técnica No. 29).

CENICAÑA. (2008). Informe anual 2007. Centro de Investigación de la Caña de Azúcar de Colombia, Cali, Colombia. 9–12, 66–67.

CENICAÑA. (2009a). Informe anual 2008. Centro de Investigación de la Caña de Azúcar de Colombia, Cali, Colombia. 71–78.

CENICAÑA. (2009b). Grupos de Transferencia de Tecnología. Caracterización de base. Centro de Investigación de la Caña de Azúcar de Colombia. Accessed 21 July 2009. http://www.cenicana.org/investigacion/sctt/red_gtt.php.

CREA. (2009). ¿Qué es CREA? Consorcios Regionales de Experimentación Agrícola. Accessed 21 Jul. 2009. http://www.crea.org.ar/aacrea/site/PortalInstitucional-internet/Institucional/indice.html.

INIA. (2009). GTT. Una metodología eficaz de trabajo grupal. Instituto de Investigaciones Agropecuarias. Accessed 21 July 2009. http://www.inia.cl/link.cgi/Transferencia/1005.

Isaacs Echeverry, C.H. (1999). Una mirada al desarrollo de la industria agrícola chilena. CENICAÑA, Cali, Colombia. 18 p. (Documento de Trabajo No.470).

Isaacs Echeverry, C.H., Carrillo Camacho, V.E., Caicedo Muñoz, G.H., Paz Torres, H.G. and Palma Zamora, A.E. (2000). Los clientes de la nueva tecnología. Censo y tipificación de productores de caña de azúcar de la industria azucarera colombiana, 1998. CENICAÑA, Cali, Colombia. 64 p. (Serie Técnica No. 27).

Isaacs Echeverry, C.H., Caicedo Muñoz, G.H. and Raigosa Varela, J.P. (2002). Caracterización conductual de productores de caña de azúcar. Análisis descriptivo. Primer Informe Técnico. CENICAÑA, Cali, Colombia. 62 p. (Documento de Trabajo No. 492).

Isaacs Echeverry, C.H. and Uribe Jaramillo, P.T. (2002). Grupos de transferencia de tecnología con el enfoque de agricultura específica por sitio. Carta Trimestral 24, 3 y 4: 23–26.

Isaacs Echeverry, C.H., Castillo, S., Gómez, J.F., Moreno, C. and Posada, C. (2009a). Aplicación de prácticas reducidas al cultivo de la caña de azúcar y su impacto en la productividad y rentabilidad en el valle geográfico del río Cauca. CENICAÑA, Cali, Colombia. 23 p.

Isaacs Echeverry, C.H., Zamorano, D., Villegas, A., Posada, C. and Moreno, C. (2009b). Impacto del uso de prácticas agronómicas con el enfoque de agricultura por sitio (AEPS) en la rentabilidad de la caña de azúcar. CENICAÑA, Cali, Colombia. 21 p.

Pino Orozco, Y. (2007). Informe final. Convenio Joven Investigador Colciencias-CENICAÑA. Evaluación de la adopción y el impacto de la nueva tecnología de CENICAÑA en el sector azucarero colombiano. (Caso piloto Ingenio Providencia) CENICAÑA, Cali, Colombia. 109 p.

Puyol, R., Estébanez, J. and Méndez, R. (1995). Geografía humana. Madrid, Cátedra. p. 339.

GROUPES DE TRANSFERT DE TECHNOLOGIE ET LEURS INCIDENCES SUR L'INNOVATION TECHNOLOGIQUE DE L'AGRO-INDUSTRIE SUCRIERE DANS LE CAUCA VALLEE, COLOMBIE

Par

C.H. ISAACS, S.V. CASTILLO, V.E. CARRILLO,
L.A. MOSQUERA et A. FRANCO
CENICAÑA, Cali, Colombie
chisaacs@cenicana.org

MOTS-CLES: Groupe de Transfert de Technologie, Agro-Industrie Sucrière, Innovation Technologique, Caractérisation des Unités Productives, Suivi Dynamique.

Résumé

L'OBJECTIF de cette étude était de mesurer l'impact de la stratégie de transfert de technologie pour former des groupes de producteurs de canne appelés Groupes de Transfert de Technologie (GTT – acronyme espagnol) dans le processus d'innovation technologique dans l'agro-industrie de la canne à sucre dans la vallée du Cauca en Colombie. Les GTTs ont donné priorité à leurs besoins pour obtenir des informations techniques et ont ensuite mis en place un programme de sensibilisation et d'échange des meilleures pratiques culturales selon différentes méthodes de communication du groupe. Deux ans après que le programme ait été lancé, un processus dynamique d'innovation technologique dans les unités de production a commencé; et les changements dans le processus d'adoption de la technologie ont été caractérisés au fil du temps, en se concentrant sur les facteurs les plus influents dans le processus. Le suivi qui a été effectué à partir d'un échantillon représentatif des producteurs de canne, a démontré que les échanges entre eux ont permis à une adoption plus rapide et à un niveau supérieur de technologie (variétés de canne à sucre et pratiques agronomiques), ainsi qu'une meilleure productivité de leurs unités de production. En plus de cela, les pratiques agricoles se sont améliorées, les interactions, la communication, l'intégration entre les producteurs, les techniciens d'usine et les chercheurs se sont renforcés. L'adoption de la technologie, produit de la recherche du CENICAÑA, a conduit à un processus dynamique de l'innovation technologique dans le secteur de l'agro-industrie sucrière, car les nouvelles pratiques agricoles génèrent plus de revenus pour les producteurs, et assurent la durabilité et la compétitivité.

GRUPOS DE TRANSFERENCIA DE TECNOLOGÍA Y SU IMPACTO EN LA INNOVACIÓN DE TECNOLOGÍA EN LA AGROINDUSTRIA AZUCARERA DEL VALLE DEL CAUCA, COLOMBIA

Por

C.H. ISAACS, S.V. CASTILLO, V.E. CARRILLO,
L.A. MOSQUERA y A. FRANCO
CENICAÑA, Cali, Colombia
chisaacs@cenicana.org

PALABRAS CLAVE: Grupos de Transferencia de Tecnología, Agroindustria Azucarera Colombiana, Innovación de Tecnología, Caracterización de Unidades de Producción, Monitoreo Dinámico.

Resumen

EL OBJETIVO de este estudio fue la medición del impacto de una estrategia de transferencia de tecnología basada en la formación de grupos de productores de caña denominados Grupos de Transferencia de Tecnología (GTT) en el proceso de innovación tecnológica en la agroindustria azucarera del Valle del Cauca en Colombia. Los GTTs priorizaron sus necesidades de información técnica y luego implementaron un programa para conseguir e intercambiar las mejores prácticas culturales, basados en varios métodos de comunicación de grupo. Dos años después de haber iniciado el programa, empezó un proceso dinámico de monitoreo de innovaciones tecnológicas en las unidades de producción; y los cambios en el proceso de adopción de tecnologías fueron caracterizados en el tiempo, enfocados en los factores que influenciaron más el proceso. En el monitoreo, que fue realizado con una muestra representativa de los productores de caña, se encontró que el mayor intercambio de las mejores prácticas entre ellos, condujo a la adopción más rápida y al incremento de los niveles de adopción de tecnologías (variedades de caña y prácticas agronómicas), así como la productividad en sus unidades de producción. Adicionalmente, creó una cultura de prácticas agrícolas basada en agricultura de sitios específicos y fortaleció las interacciones, comunicación e integración entre productores, profesionales de los ingenios e investigadores. La mayor adopción de tecnología, producto de la investigación de CENICAÑA, ha llevado a un proceso dinámico de innovación tecnológica en la agroindustria azucarera mientras las nuevas prácticas agrícolas generan retornos más altos para los productores, sostenibilidad y competitividad.